SOIL SURVEY

Van Wert County Ohio

Issued July 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Lands and Soil
and
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

Major fieldwork for this soil survey was done in the period 1955–63. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1963. This survey was made cooperatively by the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Van Wert Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Van Wert County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes, other than cultivated crops and woodland, can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of capability units.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for buildings of three stories or less and for recreation areas in the section "Soils and Land Use Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Van Wert County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "Additional Facts About the County."

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Issued July 1972

SOIL SURVEY OF VAN WERT COUNTY, OHIO

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL, AND THE OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

VAN WERT COUNTY is in northwestern Ohio (fig. 1). It extends 21 miles in a north-south direction and

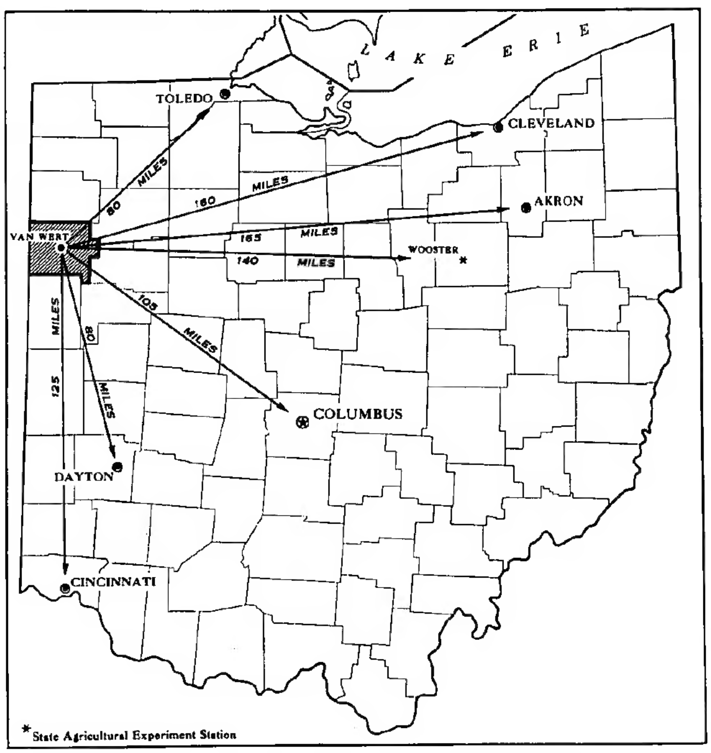

Figure 1.—Location of Van Wert County in Ohio.

24 miles in an east-west direction and has an area of 261,760 acres, or 409 square miles. In 1960 the population of the county was 28,840 and that of the city of Van Wert, which is the county seat and largest city, was 11,323.

This county has large areas of deep, dark-colored, nearly level, fertile soils that are well suited to cash-grain crops. Each year, a large acreage is used for corn and soybeans. Less than 10 percent of the county is wooded.

In areas south of U.S. Route 30, the soils formed mostly in glacial till deposited by the Wisconsin-age glacier that once covered the county. In areas north of this highway, the soils formed mostly in water-worked till, lacustrine sediments, and old beach-ridge deposits. These areas were covered by lake water after the glacier had retreated and are now part of the Lake Plain in northwestern Ohio.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Van Wert County, where they are located, and how they can be used. The soil scientists went into the county knowing they were likely to find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants, or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (10)[1].

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Haney and Nappanee, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For ex-

[1] Italic numbers in parentheses refer to Literature Cited, p. 72.

ample, Haney sandy loam, 2 to 6 percent slopes, is one of three phases within the Haney series, which in this county has two different surface textures.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so disturbed by man's activities that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Clay pits is a land type in Van Wert County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Van Wert County. A soil association is a landscape that has a distinctive pattern of soils. It normally consists of one or more major soils and several minor soils, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Van Wert County are discussed in the following pages. A comparison of the general soil map of this county with that of adjoining areas of Paulding County and Allen County in Ohio and Allen County in Indiana will show that the boundaries of some of the soil associations do not match perfectly. These differences arise partly because the soils occur in differing patterns and proportions in these counties. The soils differ from county to county in some places because continuing refinement of the soil classification system has resulted in some changes in classification by soil series and in changes in conventions for naming soils and miscellaneous land types.

1. Wabasha association

Very poorly drained soils on flood plains along the Little Auglaize River and its tributaries

This association is on first bottoms along the major streams, mainly in the eastern and northeastern parts of the county. Among the major streams are the Little Auglaize River and its main tributaries. The soils of this association are nearly level. Surface runoff is slow. The water table is seasonally high, and the soils are subject to flooding.

This association makes up about 3 percent of the county. About 70 percent of the association consists of Wabasha soils. Among the minor soils making up the rest of this association are the somewhat poorly drained Defiance soils on flood plains and the somewhat poorly drained Digby and Haskins soils on stream terraces.

Wabasha soils are dark colored, very poorly drained, and slowly permeable. They are clayey in most places, but they have a plow layer of silty clay loam in some areas. These soils are generally difficult to manage for farming because of seasonal wetness, the flooding hazard, and their slowness in drying out in spring.

This association is used mainly for cash-grain crops, permanent pasture, and woodland. All the soils are suited to row crops, but they are not well suited to small grain, because of the very poor natural drainage and the flooding hazard. Areas that are frequently flooded or that are difficult to drain are commonly used for pasture or woodland. In some areas drainage outlets are difficult to establish.

2. Sloan association

Very poorly drained soils on flood plains along the St. Marys River and Twentyseven Mile Creek

This association is on first bottoms along the St. Marys River and its tributary, Twentyseven Mile Creek. The soils are occasionally flooded, usually in winter and early in spring. They are less clayey than the soils of association 1.

This association makes up less than 1 percent of the county. About 85 percent of the association consists of Sloan soils. Among the minor soils making up the rest of this association are the moderately well drained Eel soils

and the somewhat poorly drained Shoals soils, both of which are on first bottoms, and the somewhat poorly drained Digby and Haskins soils, which are in a few areas of the stream terraces.

Sloan soils are dark colored, very poorly drained, and medium textured or moderately fine textured. They occur in low positions on the flood plains.

This association is used mainly for general farming, but about 20 percent is woodland. The dominant soils are suited to row crops, but they are not well suited to small grain, because of the very poor natural drainage and the flooding. The flooding and the drainage are the main management problems. Areas that are frequently flooded or that are difficult to drain are commonly used for pasture or woodland. In many places tile outlets are difficult to establish because the soils are in low positions relative to the streams.

3. *Digby-Belmore-Haney association*

Somewhat poorly drained to well-drained soils on beach ridges and stream terraces

This association is mainly on beach ridges that extend from the east-central part of the county to the northwestern corner, but a small acreage is on stream terraces along the St. Marys River. The beach ridges are generally 10 to 20 feet higher than the adjacent lake plain.

This association makes up about 2 percent of the county. About 30 percent of the association consists of Digby soils, 20 percent of Belmore soils, and 15 percent of Haney soils. Among the minor soils making up the rest of this association are the dark-colored, very poorly drained Mermill and Millgrove soils, the light-colored, somewhat poorly drained Haskins soils, and the moderately well drained Rawson soils.

Digby soils are nearly level to gently sloping and somewhat poorly drained. They have a seasonal high water table, and in spring they dry out more slowly than Belmore and Haney soils.

Belmore and Haney soils are nearly level to sloping. They dry out quickly in spring because they are underlain by sand and gravel. Belmore soils are well drained, and Haney soils are moderately well drained.

This association is used for general farm crops, building sites, and roadways. All the major soils are suitable for farming, but they are droughty late in summer. Belmore and Haney soils are well suited to early field crops and truck crops as well as to building sites. Digby, Haskins, Mermill, and Millgrove soils dry out earlier in spring if they are artificially drained. U.S. Route 30 was built along the crest of beach ridges in this association.

4. *Montgomery association*

Very poorly drained, nearly level to depressional soils that are subject to ponding; on uplands

This association consists of small scattered areas on broad flats and in depressions along the upper end of drainageways in the southern part of the county. These areas are ponded after heavy rains, except where artificial drainage has been established.

This association makes up about 2 percent of the county. About 90 percent of the association consists of Montgomery soils. Among the minor soils making up the rest of this association are the light-colored Blount soils along the eastern edge of Jennings Township and the dark-colored, very poorly drained Pewamo soils in other areas.

Montgomery soils are deep, dark colored, and very poorly drained. They have a water table that is seasonally high for long periods.

This association is well suited to farming where adequate artificial drainage has been established. The main limitation for most uses is the very poor natural drainage. Drained areas are used mainly for cash-grain crops and specialty crops. Sugar beets and tomatoes are more widely grown than other specialty crops. A small acreage is used for woodland or pasture. The areas used for woodland are commonly undrained.

5. *Latty association*

Very poorly drained, nearly level soils on the lake plain

This association consists of a broad area of the lake plain extending across the northern part of Jackson and Hoaglin Townships and into the northeastern corner of Union Township. The soils of this association formed in clayey sediments.

This association makes up about 4 percent of the county. About 90 percent of the association is Latty soils. Among the minor soils that make up the rest of this association are the better drained Digby, Haskins, Nappanee, and St. Clair soils. These soils occur on slope breaks along streams.

Latty soils are very poorly drained, very slowly permeable to slowly permeable, and, in most places, clayey throughout. Surface runoff is very slow to ponded.

This association is used mainly for cash-grain crops, but a small part of the acreage is wooded. The number of livestock raised has decreased considerably in the past few years, but the size of farms is increasing. Very poor natural drainage and poor soil tilth are the main limitations. Both surface and subsurface drains are used for artificial drainage. The Latty soils drain slowly with tile, but artificial drainage speeds up drying in spring. Undrained areas are wet for long periods in winter and spring.

6. *Hoytville association*

Dark-colored, very poorly drained soils that formed in water-worked glacial till; on the lake plain

This association is on the lake plain in the northern part of the county. It consists of nearly level areas, narrow slope breaks along streams, and slight rises that are scattered on the plain. It surrounds most of the beach ridges.

This association makes up about 32 percent of the county. About 90 percent of this association consists of Hoytville soils. Of the minor soils that make up the rest of this association, Nappanee soils are dominant. These soils are somewhat poorly drained, light colored, and nearly level to gently sloping. They have medium available moisture capacity. They are on slight rises and on slope breaks along streams. They warm up quickly in spring. Other minor soils are Digby, Haskins, and St. Clair soils, all of which have better natural drainage than Hoytville soils.

Hoytville soils are deep, dark colored, and nearly level to depressional. They are very poorly drained and are generally saturated with water in winter and spring.

This association is used mainly for cash-grain crops, but a small acreage is woodland. The number of livestock raised has decreased considerably in the past few years, but the size of farms is increasing. Very poor natural

drainage is a severe limitation. Both surface and subsurface drains are used for artificial drainage. Artificial drainage causes the soils to dry out more quickly in spring. Drained areas of Hoytville soils are well suited to sugar beets and tomatoes. Undrained areas are not well suited to farming; they are wet for long periods in winter and spring, and they are slow to dry out in spring.

7. Pewamo-Blount association

Very poorly drained and somewhat poorly drained, nearly level to gently sloping soils on glacial till uplands.

This association consists of a broad area south of U.S. Route 30. It is more extensive than any of the other associations. In cultivated fields the contrast between the dark-colored Pewamo soils and the light-colored Blount soils is striking.

This association makes up about 45 percent of the county. About 60 percent of the association consists of Pewamo soils, and 35 percent of Blount soils. Among the minor soils that make up the rest of this association are several very poorly drained soils.

Pewamo soils are deep, dark colored, very poorly drained, and nearly level to depressional. They have a moderately fine textured or fine textured surface layer. Surface runoff is slow to ponded, permeability is moderately slow, and the available moisture capacity is high. The water table is high for long periods in winter and spring. The content of organic matter is high.

Blount soils are light colored, somewhat poorly drained, and nearly level to gently sloping. They are clayey beneath the surface layer and are slowly permeable. Their content of organic matter is lower than that of Pewamo soils.

This association is used both for cash-grain crops and for general farming. Most of the acreage is cultivated, but about 10 percent is woodland and about 10 percent is meadow. Seasonal wetness is the main limitation, but most farmed areas are artificially drained. Undrained areas are slow to dry out in spring, and much of the woodland is in these areas.

8. Blount-Pewamo association

Somewhat poorly drained and very poorly drained, gently sloping and nearly level soils on glacial till uplands

This association is in the west-central part of the county. The soils are mainly nearly level to gently sloping, but there are many small, saucer-shaped spots of soils that remain wet longer than the adjacent soils. There are few large areas of any one kind of soil. In cultivated fields, the contrast between the light-colored Blount and Morley soils and the dark-colored Pewamo soils is readily apparent.

This association makes up about 4 percent of the county. About 50 percent of the association consists of Blount soils, and 40 percent of Pewamo soils. The minor soils that make up the rest of this association consist mainly of Morley soils, which are moderately well drained. These soils occupy more sloping parts of the landscape than other soils. Surface runoff is medium to rapid.

Blount soils are somewhat poorly drained and nearly level to gently sloping. They are clayey beneath the surface layer and are slowly permeable. Unless drained, they are slow to dry out in spring.

Pewamo soils are deep, dark colored, very poorly drained, and nearly level to slightly depressional. Surface runoff is slow to ponded, and permeability is moderately slow. Unless drained, these soils are slow to dry out in spring.

This association is used mainly for cash-grain crops and for general farming, but about 15 percent of the acreage is woodland and about 10 percent is meadow. A seasonally high water table is the main limitation for farming. The Pewamo soils, which occur as many small spots, are difficult to drain because of the lack of outlets. If cultivated but not protected, Morley soils are subject to erosion because they occupy the more sloping parts of the landscape. The Morley soils in this association have fewer limitations for building sites than soils in other associations, except for the soils that occur on beach ridges.

9. Blount-Morley association

Somewhat poorly drained soils and moderately well drained soils on the Fort Wayne moraine and on slope breaks along streams

This association is on the Fort Wayne moraine in the southwestern part of the county and on slope breaks along the Little Auglaize River and south of State Route 116. The moraine is made up of many short, uneven slopes.

This association makes up about 7 percent of the county. About 50 percent consists of Blount soils, and about 30 percent of Morley soils. The minor soils that make up the rest of this association consist mainly of the dark-colored, very poorly drained Pewamo soils.

Blount soils are somewhat poorly drained, nearly level to gently sloping, and slowly permeable. They have a high water table in winter and early in spring. Unless artificially drained, they are slow to dry out in spring.

Morley soils are moderately well drained, gently sloping to moderately steep, and slowly permeable. They dry out more quickly in spring than Blount soils. Surface runoff is medium to rapid.

This association is used mainly for general farming, but about 20 percent is woodland. The dominant soils in this association are suited to the crops commonly grown in the county. The main limitation to the use of Blount soils is a seasonal high water table, and the limitation to the use of Morley soils is an erosion hazard. The Morley soils have fewer limitations for building sites than the Blount soils in this association and fewer limitations for this purpose than most other soils in the county.

10. Toledo association

Very poorly drained, nearly level soils along the south edge of the lake plain

This association consists of two areas along the upper end of drainageways in the northwestern part of the county. The soils are nearly level and very poorly drained. Unless artificially drained, they are ponded after heavy rains.

This association makes up less than 1 percent of the county. About 95 percent of this association consists of Toledo soils. The minor soils that make up the rest of this association consist mainly of the very poorly drained Pewamo soils, which are similar to Toledo soils.

Toledo soils are deep and dark colored. They formed in sediments deposited by ponded water.

This association is well suited to farm crops if adequate artificial drainage has been established. Drained areas are used mainly for cash-grain crops and specialty crops. The most widely grown specialty crops are sugar beets and tomatoes. A small acreage is in woodland or pasture. Very poor natural drainage is the main limitation. Tile and surface drains help to remove the excess water.

Use and Management of the Soils

This section explains the system of capability grouping used by the Soil Conservation Service and discusses the management of the soils in Van Wert County by capability units. Estimated yields of the principal crops are given. Also discussed are the management of soils for specialty crops, for woodland and windbreaks, and for wildlife habitat. The properties and features that affect engineering practices and the limitations that affect land use planning are enumerated, mainly in tables.

General Management Practices

There are wide variations in the use and management of the soils of Van Wert County. Field crops, pasture, and specialty crops are grown. Information about suitable crop varieties and drainage, erosion control, and other management practices can be obtained from the local offices of the Soil Conservation Service and from the Ohio Cooperative Extension Service.

Management for cultivated crops

Among the field crops commonly grown are corn and soybeans and wheat, oats, and other small grain. Some of the practices needed in the management of field crops are discussed in the following paragraphs.

MAINTENANCE OF FERTILITY.—Many soils of the county, particularly the light-colored ones, are naturally acid and have less than optimum supplies of plant nutrients. These soils need applications of lime and fertilizer in amounts based on the results of soil tests, the needs of the crop to be grown, and the yield expected. The dark-colored, very poorly drained soils generally require less lime than the lighter colored ones. Overliming them can increase the pH value to a point where the symptoms of manganese deficiency become apparent. The symptoms are particularly observable in soybeans grown on such soils as Hoytville, Pewamo, Montgomery, and Toledo soils.

UTILIZATION OF CROP RESIDUE.—In many soils of the county, especially the light-colored ones, the organic-matter content is below the optimum level. The content is 1 to 3 percent in the surface layer of the light-colored soils and 3 to 7 percent in the surface layer of the dark-colored soils. All crop residue should be incorporated into the soil. Cover crops or sod crops may be used to supplement the residue from soybeans and other row crops that leave only a small amount of residue.

DRAINAGE.—In this county, about 96 percent of the acreage needs artificial drainage. All the dark-colored soils need artificial drainage, and some of the light-colored ones on uplands need surface drainage. Many of the soils need a combination of surface drains and tile. After periods of wet weather, water stands on nearly all the somewhat poorly drained to very poorly drained soils. These soils are slow to warm up in spring, and tillage must be delayed, unless artificial drainage has been established. The well drained and moderately well drained soils are likely to be too dry during part of the growing season, and consequently, they need practices that conserve water, rather than drainage practices. They commonly occur as small, narrow areas adjacent to wet soils and, consequently, are included in drainage systems of the adjoining soils in some places. Among these are soils of the Belmore, Haney, Morley, and St. Clair series, which are especially likely to have too little moisture available during the growing season. Drainage of wet spots makes some of the larger fields more usable and is beneficial to crops.

Land smoothing, surface drainage, and tile drainage are used to remove excess water. The surface drains are broad, shallow ditches and are placed in low areas in a systematic or random pattern across a field. The ditches are generally farmed along with the rest of the field. They are commonly used to intercept water. Tile drains consist of lines of buried tile used for subsurface drainage. Outlet ditches (fig. 2) are needed for both tile drains and surface drains; they also provide some subsurface drainage. Grade-changing structures are needed to control erosion in places where surface water enters the outlet ditches.

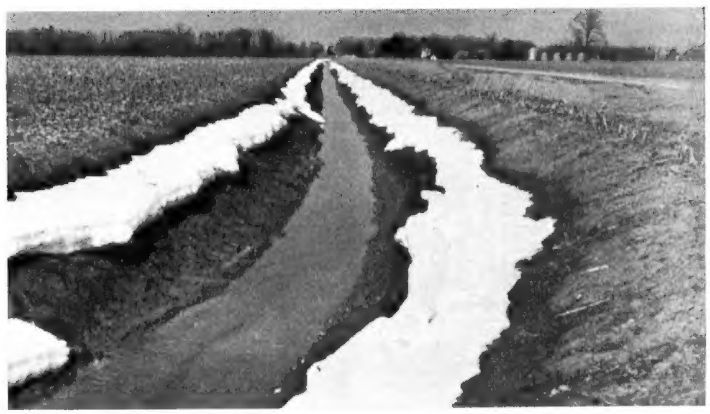

Figure 2.—A well-constructed open ditch that provides an outlet for tile and surface drains. The soils are of the Toledo, Hoytville, Latty, and Pewamo series.

CONTROL OF EROSION.—Erosion is a hazard on about 4 percent of the acreage. The control of erosion is a problem where the slope is more than 2 percent. Among the measures that can be used to control erosion are terrace and waterway systems, diversions, contour stripcropping, contour tillage, minimum tillage, utilization of crop residue, and establishment of close-growing cover crops.

TILLAGE.—The soils can be tilled only within a narrow range of moisture content. If worked when too wet, many of the soils are easily compacted. Keeping tillage to a minimum promotes good soil structure and good tilth.

CROPPING SYSTEMS.—A cropping system is satisfactory if it improves or maintains good physical condition of the soil; provides protection during the critical periods when erosion usually occurs; helps to control weeds, insects, and plant diseases; and is of economic value. Crop rotations that include grass and legumes, as well as those that do not include such crops, can be used. As the intensity of row cropping increases, the need for conservation measures increases. For example, if stripcropping is used,

a 4-year rotation that includes row crops, small grain, and 2 years of meadow is satisfactory. If contour stripcropping is not used, this cropping system is not satisfactory, because of the severe erosion hazard where row crops are grown.

Management for pasture

Among the pasture and hay plants commonly grown are alfalfa, Ladino clover, red clover, timothy, orchardgrass, and bromegrass. In general, most of the soils used for pasture are eroded, have low natural fertility, and commonly have poor tilth. Poor drainage is a limitation on some of the soils. Some of the practices needed on all or many of the soils are discussed in the following paragraphs.

CONTROL OF EROSION.—The control of erosion is particularly important during seeding. The use of mulch seeding or of a nurse crop helps to check further erosion.

DRAINAGE.—On poorly drained and somewhat poorly drained soils, artificial drainage is needed for most pasture plants. Drainage as intensive as that used for row crops is needed in places.

MAINTENANCE OF FERTILITY.—Lime and fertilizer should be applied in adequate amounts, based on the results of soil tests, on the needs of the pasture plants to be grown, and on the yields expected.

PREVENTION OF SOIL COMPACTION AND OTHER PRACTICES.—The trampling by animals of soils that are wet causes soil compaction. Among the practices that help to reduce soil compaction are harvesting hay and silage and tilling only when the soil is neither too wet nor too dry. Other good management practices are proper stocking rates, rotation or deferring of grazing, and locating watering places at points that will encourage distribution of grazing.

Management for specialty crops

The main specialty crops grown in the county are sugar beets and tomatoes, but a small acreage is in sweet corn, cucumbers, cabbage, and other truck crops. A high level of management is needed to successfully produce the specialty crops.

SUGAR BEETS AND TOMATOES.—Good tilth and good physical condition of the soil are essential for good yields of sugar beets and tomatoes. Artificially drained areas of deep, dark-colored soils that have very poor natural drainage are well suited to these crops. Such soils have high organic-matter content and high available moisture capacity. Among these are soils of the Hoytville, Pewamo, and Toledo series. Their use is limited mainly by wetness and susceptibility to compaction and deterioration of soil tilth.

TRUCK CROPS.—Loamy soils that warm up early in spring are well suited to sweet corn, cucumbers, cabbage, and other truck crops. These soils are somewhat limited by their capacity to hold moisture, but they are well suited to irrigation. Among these are the well drained Belmore soils and the moderately well drained Haney soils.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive land-forming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat. (There are no class V soils in Van Wert County.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat. (There are no class VI soils in Van Wert County.)

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat. (There are no class VII soils in Van Wert County.)

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (There are no class VIII soils in Van Wert County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most,

only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. A capability unit is generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIw-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In the following pages each of the capability units in Van Wert County is described. The names of the soil series represented are mentioned in the description of each capability unit, but the listing of the series name does not necessarily indicate that all the soils of a series are in the capability unit. The capability classification of each soil is given in the "Guide to Mapping Units," but Clay pits, Cut and fill land, and Quarry, all of which are land types, are not given a capability classification.

These descriptions stress high-level management only. Suggestions for use and management of the soils are given, and features that limit the use of the soils for field crops or pasture are pointed out. One or two soils have been included in some capability units even though they have some properties that differ from those of the rest of the soils in the unit. Generally, the acreage is so low that a separate description of these soils is not justified. The available moisture capacity ratings apply to the normal root zone of the commonly grown field crops, for example, corn and small grain. Additional information concerning erosion control, drainage, choice of crop varieties, and other management practices can be obtained from local offices of the Soil Conservation Service or the Ohio Cooperative Extension Service.

CAPABILITY UNIT I-1

This unit consists only of Haney loam, 0 to 2 percent slopes, a moderately well drained soil on beach ridges and stream terraces.

This soil is generally low in organic-matter content. It tends to be slightly droughty during dry periods in summer, but this droughtiness is of little consequence in years of normal rainfall. Permeability is moderate, and plant nutrients tend to leach readily from the root zone. Reaction is medium acid to slightly acid in the root zone.

There are no limitations that restrict the use of this soil for crops. Surface tilth ordinarily is good and can be maintained by using a high level of management.

This soil is well suited to hay and pasture crops and to all other crops commonly grown in the county. Row crops and specialty crops can be grown continuously if large amounts of crop residue are returned to the soil.

CAPABILITY UNIT IIe-1

This unit consists of moderately well drained or well drained, gently sloping soils of the Belmore, Haney, and Rawson series. These soils occur throughout the county and are common on beach ridges. They have a medium-textured or moderately coarse textured plow layer and a deep or moderately deep root zone. In some places the Haney soils are underlain by heavy clay at a depth of 4 or 5 feet.

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The available moisture capacity is medium, and the content of organic matter is low. Plant nutrients tend to leach rapidly from these soils. Reaction is medium acid in the root zone of most of these soils, but it is strongly acid in some areas of the Rawson soil.

The main limitation is the hazard of erosion. The soils that have a surface layer of sandy loam are more erodible than the other soils in this unit. In pastures, a thick, well-established plant cover helps to control erosion. Drainage systems are generally not needed, but the Haney and Rawson soils have seep spots. In extremely wet periods, the Haney soils become saturated and temporarily waterlogged. A random pattern of tile can be used to drain away the excess water. Crops respond well to good management. Irrigation should be considered if high-value specialty crops are to be grown.

These soils are well suited to small grain, truck crops, deep-rooted legumes, and other crops that mature early in the season. Among the crops that are damaged by drought are corn, soybeans, sugar beets, and tomatoes, but the crops can be irrigated if erosion is controlled. Pastures and meadows of shallow-rooted legumes and grasses tend to dry up during periods of below-normal rainfall.

CAPABILITY UNIT IIe-2

This unit consists of moderately well drained, gently sloping soils of the Morley series. These soils occur on uplands south of the Lake Plain. They are moderately deep to calcareous, compact glacial till. They have a loamy surface layer and a clayey texture below the surface layer.

Permeability is slow, and the available moisture capacity is medium. Surface runoff is medium, and the erosion hazard is moderate. The content of organic matter is low. The plow layer is susceptible to surface crusting, and good tilth is difficult to maintain. The root zone is moderately deep and strongly acid to neutral. The acidity decreases as depth increases.

Erosion is difficult to control where row crops are grown continuously, especially where the slope is more than 4 percent. Soil loss is likely to be excessive where row crops are grown frequently, unless a high level of management is used. In pastures, soil loss can be kept to a minimum by maintaining a thick cover of plants. Drainage is not generally needed, but in some places random tile drains are needed to eliminate small wet spots.

These soils are well suited to most crops commonly grown in the county, but they are poorly suited to sugar beets and tomatoes. If large amounts of crop residue are incorporated into the soil and other high-level management practices are used, row crops frequently can be included in the cropping system. Most of the acreage has been cleared for cultivation, and some areas are used for pasture and hay crops.

CAPABILITY UNIT IIw-1

This unit consists only of Eel silt loam, a deep, moderately well drained, nearly level soil. This soil is on first bottoms along some streams. It is flooded periodically, usually in winter and spring. Also, the water that runs

off the adjacent slopes generally accumulates on this soil.

Permeability is moderate, and the available moisture capacity is high. Reaction is neutral.

Diversion terraces along the base of the slopes help to divert runoff. Tile drains are generally not needed, except in low, wet spots. Tilth is good, but a high level of management is needed to maintain soil structure and tilth if row crops are grown continuously.

This soil is well suited to summer row crops. It can be cropped intensively, and row crops can be grown year after year if a high level of management is used. This soil is also suited to small grains and meadow, even though it is subject to flooding in winter and spring. Specialty crops should not be grown unless they can be planted and harvested in summer and fall when flooding is least likely. Small or inaccessible areas are used mainly for pasture or woodland.

CAPABILITY UNIT IIw-2

This unit consists only of Shoals silt loam, a somewhat poorly drained, nearly level soil. This soil is on first bottoms along streams and is subject to flooding. It usually remains ponded for a while after flooding or heavy rain. Excessive amounts of water that run off the adjacent slopes generally accumulate on this soil.

Permeability is moderately slow, and the available moisture capacity is high. The water table is seasonally high. The root zone is deep and is favorable for the development of roots when the water table is low in summer, or where it has been lowered by artificial drainage. Reaction in the root zone is neutral.

The control of water is the main management problem. Artificial drainage is beneficial to crops, and protection from flooding is desirable. Shallow surface drains can be used as outlets for the ponded water. Although beneficial, tile drainage is difficult to establish because suitable tile outlets are likely to be submerged during flooding.

This soil is suited to intensive cropping if artificial drainage is adequate and other high-level management practices are followed. It is suited to the row crops that can be planted after the period of most spring flooding. Oats, wheat, and specialized crops can be damaged by flooding or can be stunted as a result of the high water table. Alfalfa ordinarily heaves in winter, and it is drowned out during prolonged flooding. Pasture and meadow that consist mainly of alsike clover, Ladino clover, and bluegrass grow well. Small or inaccessible areas are used mainly for pasture or woodland, but grazing when the soil is wet causes soil compaction and can damage pasture grasses and legumes.

CAPABILITY UNIT IIw-3

This unit consists of somewhat poorly drained, nearly level to gently sloping soils of the Digby, Haskins, and Kibbie series. These soils occur throughout the county. They have a medium-textured or moderately coarse textured surface layer. Digby soils are sandy and gravelly within 40 inches of the surface. Haskins soils are moderately deep to a calcareous, fine-textured layer.

The water table is high in winter and spring. Most roots are concentrated within the uppermost 40 inches of the soils. Permeability is moderate within the uppermost 20 to 40 inches. Reaction is very strongly acid to neutral, depending upon the amount of lime that has been applied.

The main limitation for farming is seasonal wetness. Artificial drainage is needed, and tile drains work well. Surface drains can be used where water ponds. The control of water erosion is a problem where the slope is 2 to 6 percent. Drought damages crops during periods when rainfall is lower than normal, but crops on these soils withstand prolonged dry spells better than those on better drained soils. These soils are well suited to irrigation. Incorporating large amounts of crop residue into the soil helps to improve soil structure and tilth and, on the Kibbie soil, to limit crusting.

If properly managed, these soils are well suited to most crops commonly grown in the county, but they are only moderately well suited to sugar beets and tomatoes. Row crops can be grown frequently under a high level of management. Both drained and undrained areas of these soils are suited to pasture or meadow if the plants chosen are suited to the drainage condition. Adequate drainage is beneficial to pasture plants.

CAPABILITY UNIT IIw-4

This unit consists of somewhat poorly drained, nearly level to gently sloping soils of the Blount and Elliott series. These soils are on uplands south of the beach ridges. In many areas they receive runoff from the more strongly sloping adjacent soils, and in places they are subject to ponding.

Internal soil drainage is slow, and the available moisture capacity is medium. Surface runoff is slow to rapid, depending on the slope, and erosion is a hazard in areas where the slope is 2 to 6 percent. The root zone is moderately deep. The Elliott soil is high in content of organic matter and is dark colored. The Blount soils are moderately low in organic-matter content and are light colored. Because of its higher content of organic matter, the Elliott soil is less susceptible to surface crusting than the Blount soils.

The main limitation for farming is somewhat poor natural drainage. Surface or tile drains generally help to provide adequate drainage so that excess water does not limit the growth of crops. Shallow surface drains are especially helpful in areas that are subject to ponding. Tile can be used, but drainage by tile is slow because water moves slowly through these soils. The soils can be tilled only within a relatively narrow range of moisture content, but they are often tilled while they are still wet because they are so slow to warm up and dry out in spring. Returning large amounts of crop residue to the soil helps to control surface crusting. The need for lime is usually greater in the Blount soils than in the Elliott soil. A high level of management is especially beneficial to crops.

These soils are suited to all the field crops commonly grown in the county. Stands of oats and meadow are poor in some years unless adequate drainage is provided. The Elliott soils are suited to sugar beets and tomatoes, but the Blount soils are poorly suited. Row crops can be frequently included in the cropping system, but erosion and loss of tilth and productivity are likely unless a high level of management is followed. These soils can be used for pasture, but they are subject to compaction if grazed while wet.

CAPABILITY UNIT IIw-5

This unit consists of very poorly drained, nearly level, dark-colored soils of the Colwood, Mermill, and Millgrove

series. These soils are on the lake plain, beach ridges, outwash plains, and stream terraces. They have a medium-textured or moderately fine textured surface layer. Some areas receive seepage continuously from surrounding areas.

The water table is seasonally high for long periods, unless artificial drainage has been provided. The root zone is moderately deep or deep when the water table is low in summer or where it has been lowered by drainage. Tilth is good in the surface layer. The available moisture capacity is medium or high. Reaction is neutral.

These soils can be cultivated year after year if a high level of management is used, but they can be tilled only within a narrow range of moisture content. Good tilth is harder to maintain in Millgrove silty clay loam than in the other soils. Crops respond favorably to artificial drainage. Surface drains help to remove excess water. A tile drainage system helps to remove water from the root zone. If adequately drained, the soils are well suited to irrigation.

These soils are well suited to row crops and tomatoes, sugar beets, and other specialty crops if drainage has been established. Drained areas of these soils are seldom used for pasture or hay crops. Unless adequate drainage is provided, poor stands of wheat and oats can be expected in most years. Crops respond well to a high level of management.

CAPABILITY UNIT IIw-6

This unit consists of very poorly drained, dark-colored soils of the Hoytville and Pewamo series. Because of their topographic position, some areas of these soils receive runoff and seepage from adjacent soils. They have a moderately fine textured or fine textured surface layer.

Surface runoff is slow to ponded, and permeability is slow. The water table is high for long periods in winter and spring, unless drainage has been provided. The root zone is deep when the water table is lowered in summer or where it has been lowered by drainage. Reaction is neutral in the root zone.

The main limitation is the very poor natural drainage. Both surface drainage and internal drainage are needed (fig. 3). A combination of shallow surface drains and tile works well. Tile drains remove water more slowly from the soils of this unit than from soils of capability unit IIw-5. These soils become dense and compact where cropped year after year unless large amounts of residue are returned to the soil. Tillage at the proper time is important, especially where the soils have a surface layer of silty clay or clay, because the soils puddle and clod if worked when too wet.

Figure 3.—Ponding of water as a result of slow permeability and of level to depressional topography. Surface drains can help to remove the water. The soil is Hoytville silty clay loam, which is in capability unit IIw-6.

These soils are well suited to all crops commonly grown in the county, and if drained, they are well suited to sugar beets and tomatoes. They can be cultivated year after year if good tilth is maintained. Stands of wheat and oats are poor in some years, unless adequate drainage has been provided. These soils are well suited to hay and pasture, but they are subject to compaction if grazed while wet and soft.

CAPABILITY UNIT IIs-1

This unit consists only of Belmore loam, 0 to 2 percent slopes, a well-drained soil that is moderately deep to sand and gravel in most places. This soil is on beach ridges, stream terraces, and outwash plains.

Permeability is moderately rapid. The available moisture capacity is medium, but the moisture is easily depleted by growing crops. Plant nutrients tend to leach from the soil readily. Reaction is strongly acid to neutral in the root zone.

This soil is well suited to small grain, early truck crops, deep-rooted legumes, and other crops that mature early. Crops that need an entire growing season to mature may be damaged by drought in years when rainfall is below normal or is not timely. Among these crops are corn, soybeans, sugar beets, and tomatoes. This soil is also well suited to deep-rooted pasture and meadow plants, but pasture and meadow are made up mainly of shallow-rooted legumes and grasses that dry up during periods when rainfall is below normal. This soil is well suited to irrigation.

CAPABILITY UNIT IIIe-1

This unit consists only of Belmore loam, 6 to 12 percent slopes, a deep, well-drained soil that is moderately deep to sand and gravel in most places. This soil is on beach ridges and stream terraces. The slopes are generally short, and many areas are not farmed.

This soil is slightly eroded, but the hazard of erosion is severe in unprotected cultivated fields. Permeability is moderately rapid, and the available moisture capacity is medium. Plant nutrients tend to leach from the soil readily. Reaction is strongly acid to neutral in the root zone.

The crops respond well to a high level of management, but droughtiness damages them during periods when rainfall is below normal or is not timely. A thick cover of plants in pasture and hay meadows helps to control erosion.

This soil is well suited to crops that mature early. It is better suited to small grain, row crops, meadows, and pastures than to sugar beets, tomatoes, and other specialty crops. Row crops can be grown where erosion is controlled. This soil is well suited to pasture and hay crops, except in summer when the soil tends to be droughty. It is well suited to irrigation if erosion is controlled.

CAPABILITY UNIT IIIe-2

This unit consists of moderately well drained soils of the Morley and St. Clair series. These soils have a surface

layer of silt loam, but in places erosion has thinned the surface layer.

These soils are low in organic-matter content. They take in water slowly, and they are droughty late in summer when rainfall is ordinarily low. Permeability is slow to very slow, and the clayey subsoil retards the downward movement of water. Surface runoff is rapid, and the erosion hazard is severe.

The root zone is moderately deep to shallow; its depth varies with the depth to underlying compact glacial till. The available moisture capacity is medium to low within the root zone. Reaction is strongly acid in the upper part and slightly acid to neutral in the lower part.

The main limitation in cultivated areas is the severe hazard of erosion. The control of surface runoff is important in checking further loss of soil through erosion. A thick cover of plants in pastures and meadows helps to control erosion. Tilth is generally poor, but it can be improved by including grasses and legumes in the cropping system. The soils puddle and crust easily. Productivity is generally low to unsatisfactory, unless a high level of management is used.

The soils in this unit are suited to most of the field crops and hay and pasture crops that are commonly grown in the county. They are not well suited to specialty crops. Row crops can be grown frequently if erosion is controlled.

CAPABILITY UNIT IIIe-3

This unit consists only of Blount silt loam, 2 to 6 percent slopes, moderately eroded, a somewhat poorly drained soil. This soil has a clayey subsoil.

The content of organic matter is low. Good tilth is hard to maintain because erosion has removed part of the surface layer. The erosion hazard is severe in cultivated areas. The water table is seasonally high, but this is not so serious a problem on this soil as on the nearly level Blount soils. Permeability is slow.

The root zone is moderately deep, and the available moisture capacity is medium. Reaction is very strongly acid in the upper part of the root zone, but it is less acid as depth increases.

A high level of management is needed to minimize the effect of limitations inherent in the soil. Loss of soil from erosion is likely to be excessive, if a high level of management is not used. Grazing when the soil is too wet can cause compaction of the soil and damage pasture.

This soil is suited to the field crops and hay and pasture plants commonly grown in the county, but it is not especially well suited to sugar beets and tomatoes. Row crops can be frequently included in the cropping system if erosion is controlled and good tilth is maintained. Including grasses and legumes in the cropping system helps to control erosion and to maintain tilth in cultivated areas.

CAPABILITY UNIT IIIw-1

This unit consists of somewhat poorly drained soils of the McGary and Nappanee series. These soils have a medium-textured or moderately fine textured surface layer. The McGary soil is moderately deep to deep to calcareous sediments. The Nappanee soils are shallow to moderately deep to compact, calcareous till.

Surface runoff is slow to ponded. Permeability is slow to very slow because of the fine-textured and relatively impervious subsoil and substratum. The water table is seasonally high. The soils are slow to warm up and to dry out in spring, but they tend to be droughty in midsummer. The content of organic matter is generally low. The available moisture capacity is medium to high in the McGary soil and medium to low in the Nappanee soils.

All the soils have a clayey root zone beneath the plow layer. Reaction in the root zone is mainly medium acid, but it ranges from strongly acid to slightly acid.

The main limitation is somewhat poor natural drainage, and artificial drainage is beneficial to crops and pasture. A combination of shallow surface drains and tile drains helps to remove the excess water, but the movement of water into tile drains is slow. Maintenance of good tilth is a problem, partly because the content of organic matter is low and partly because the soils are so slow to dry out in spring that they are often tilled when too wet. Tilling when the soil is too wet compacts the soil and destroys the structure and tilth. If good tilth is not maintained, the soils puddle when wet and crust when dry. They compact easily if grazed when wet.

These soils are suited to all the field crops and pasture and hay crops commonly grown in the county. They are not well suited to tomatoes and sugar beets, unless a high level of management is used. Row crops can be grown frequently if tilth is good, but if grasses and legumes are not included in the cropping system, good tilth is difficult to maintain.

CAPABILITY UNIT IIIw-2

This unit consists of Hoytville silty clay loam, moderately shallow variant, a very poorly drained, nearly level, dark-colored soil. This soil is on the lake plain. The depth to limestone bedrock ranges from 20 to 40 inches.

The content of organic matter in the surface layer is medium to high. The water table is seasonally high. The root zone is moderately deep, and reaction is neutral.

The main limitation for farming is very poor natural drainage, but the installation of tile drains is difficult in places because the depth to limestone is only moderate. Shallow surface drains help to remove water ponded on the surface. This soil can be tilled only within a narrow range of moisture content, but because it dries slowly, it is sometimes worked when wet. Consequently, clods form and the need for tillage is increased. There is little or no risk of crusting because of the medium to high content of organic matter in the surface layer. Grazing when the soil is wet results in compaction of the soil and lowered productivity of the pasture.

Artificially drained areas of this soil are suited to all commonly grown crops except sugar beets, but undrained areas are better suited to pasture and meadow. This soil is better suited to crops that require only a moderately deep root zone and to water-tolerant pasture and hay crops than to other crops.

CAPABILITY UNIT IIIw-3

This unit consists of somewhat poorly drained, gently sloping soils of the Nappanee series. These soils are on the lake plain. They have a medium-textured or moderately fine textured surface layer and clayey material beneath the plow layer.

Surface runoff is rapid, and the erosion hazard is severe in cultivated areas. The available moisture capacity is

medium to low. The clayey material and the underlying compact glacial till restrict the downward movement of water and the penetration of roots, but some roots penetrate downward along vertical cracks. The air-water relationships are poor for plant roots. The water table is seasonally high, and undrained areas are slow to warm up and dry out in spring. The content of organic matter is low.

The root zone is shallow to moderately deep; its depth is limited by the compact, calcareous glacial till. Reaction in the root zone is strongly acid to neutral.

The use of this soil for farming is limited by wetness. Artificial drainage helps to lower the seasonal high water table. Tile drains are generally used to help remove the excess water from the root zone, but the movement of water into the tile is slow. These soils puddle and clod if worked when too wet. The tendency to surface crusting is greater in Nappanee silt loam than in Nappanee silty clay loam. Including grasses, legumes, and other crops that produce a large amount of residue in the cropping system helps to control erosion and maintain good tilth if the residue is returned to the soils. Early grazing is not a suitable practice, because the soils are slow to dry out in spring.

These soils are suited to most of the field crops and pasture and hay crops commonly grown in the county. They are suited to tomatoes but are poorly suited to sugar beets. The suitability for crops is poor, unless a high level of management is used.

CAPABILITY UNIT IIIw-4

This unit consists of somewhat poorly drained and very poorly drained, nearly level soils of the Defiance, Sloan, and Wabasha series. These soils are on flood plains. Ordinarily, they receive runoff from adjacent slopes, and low areas remain ponded after the floodwater has receded. They have a medium-textured to fine-textured surface layer. The moderately shallow variant of the Wabasha soils is underlain by limestone at a depth of 20 to 40 inches.

The water table is seasonally high. The available moisture capacity is high. The Sloan and Wabasha soils, which are dark colored, have a relatively high content of organic matter. The Defiance soils have a lighter colored surface layer and a lower content of organic matter.

The main limitations for farming are flooding and the seasonally high water table. Tile drains and shallow surface drains can be used to remove ponded water where outlets are available. Suitable tile outlets are difficult to establish in many places because they are submerged during flooding and, in time, become plugged with fine-textured material. Diversion terraces constructed along the base of slopes help to control runoff. The maintenance of good tilth is more of a problem in Wabasha silty clay than in the other soils, and tillage operations are more difficult because of the high content of clay. Crops benefit from a high level of management. Grazing when the soil is wet compacts the soil and damages the pasture plants.

The soils in this unit are suited to row crops that can be planted after the period when most spring floods occur, if a high level of management is used. They are not well suited to specialty crops, because they are slow to dry out in spring and because of the risk of flooding. Row crops frequently can be included in the cropping system or even year after year if a high level of management is used so that tilth is maintained. Oats and wheat are usually damaged by floodwater or stunted as a result of the high water table. Water-tolerant plants are more suitable than other plants for pasture or meadow.

CAPABILITY UNIT IIIw-5

This unit consists of very poorly drained soils of the Latty, Montgomery, and Toledo series. The Latty and Toledo soils are in broad, nearly level to depressional areas on the lake plain, and the Montgomery soils are in broad depressions south of the beach ridges. These soils have a moderately fine textured to fine textured surface layer and, beneath the plow layer, clayey soil material. The surface layer has a high proportion of clay, and it is generally hard and cloddy when dry and sticky and plastic when wet.

Permeability is very slow or slow, and ponding is likely. The water table is high in winter and spring. The organic-matter content is low in the Latty soils and high in the Montgomery and Toledo soils. Reaction is neutral in the root zone.

The main limitation for farming is the very poor natural drainage. Tile drainage is rather slow, even where good tilth is maintained. A combination of tile and shallow surface drains helps to remove water. The shallow surface drains can be farmed as part of the regular field operations. The use of grade-changing structures in places where the water from surface drains enters the deeper outlet ditches helps to control erosion.

These soils are commonly tilled when too wet. To maintain good tilth, it is important to work these soils when they are neither too wet nor too dry. Satisfactory tilth is more difficult to maintain in the Latty soils than in the other soils because the content of organic matter in the Latty soils is lower. The crops benefit if good tilth is maintained. If pastures are grazed and trampled when too wet, the soils become compacted and hard.

If adequately drained, the soils in this unit are well suited to sugar beets and tomatoes as well as to all crops commonly grown in the county. Cultivated crops can be grown year after year if a high level of management is used.

CAPABILITY UNIT IVe-1

This unit consists only of Morley silt loam, 12 to 18 percent slopes, moderately eroded, a moderately well drained soil. This soil is on the Fort Wayne moraine and along streams. It is moderately deep to compact, calcareous till. The slopes are commonly short.

The available moisture capacity is medium. The surface layer is low in organic-matter content and is subject to crusting. Reaction is strongly acid to neutral in the root zone and changes from acid to neutral as depth increases.

The main limitation for farming is the very severe erosion hazard. Under both ordinary and high levels of management, the emphasis should be on practices that control erosion and maintain good tilth. The short slopes cause some problems in the operation of machinery and in the installation of erosion control measures. A thick plant cover helps to control erosion. If plowed when wet, the soil is cloddy.

This soil is better suited to meadow and pasture than

to row crops, but row crops can be grown occasionally if a high level of management is used. It is poorly suited to specialty crops.

CAPABILITY UNIT IVe-2

This unit consists only of St. Clair silt loam, 6 to 12 percent slopes, moderately eroded, a moderately well drained soil. This soil is generally on slope breaks between the lake plain and the flood plains along streams. It has short slopes. It is shallow to dense, calcareous glacial till in most places.

This soil dries out rapidly in summer and is droughty. Permeability is very slow, and the growth of roots is retarded in the underlying dense till. The available moisture capacity and the content of organic matter are low. Reaction is medium acid to neutral in the root zone. Tilth is poor.

The main limitation for farming is the very severe erosion hazard. Because of the short slopes, the control of erosion is difficult. In cultivated areas, erosion is a continuous hazard, but a thick plant cover reduces the hazard. Good stands of pasture are hard to obtain because of the poor tilth and the droughtiness in summer; a high level of management increases the chances of obtaining good stands.

This soil is better suited to small grain and to meadow and pasture than to row crops. Cultivated crops can be grown occasionally. Where small areas of this soil are in cultivated fields, they are left in permanent grasses and legumes in many places.

Estimated Yields

Table 1 gives estimates of average yields per acre of the principal crops of Van Wert County, under two levels of management. These estimates are based on observations, field trials, experiments conducted by the Ohio Agricultural Research and Development Center, and information supplied by farmers and other agricultural workers. These estimates represent average production over a period of years. They are intended only as a general guide to relative productivity of the soils and as an indication of crop response under two levels of management. They can be expected to change as farming techniques improve.

TABLE 1.—*Estimated average yields per acre of principal crops under two levels of management*

[Yields in columns A are those to be expected under improved management; yields in columns B are those to be expected under optimum management. Dashes indicate that the crop is not well suited to the soil or is not commonly grown. Clay pits, Cut and fill land, and Quarry are not listed, because they are not suited to crops]

Soil	Corn		Soybeans		Oats		Wheat		Alfalfa-grass		Tomatoes	Sugar beets
	A	B	A	B	A	B	A	B	A	B	B	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Belmore sandy loam, 2 to 6 percent slopes	60	80	21	28	55	65	33	43	2.4	4.0	----	----
Belmore loam, 0 to 2 percent slopes	60	90	20	30	55	70	33	50	2.7	4.0	----	----
Belmore loam, 2 to 6 percent slopes	60	85	20	30	50	70	33	48	2.7	4.0	----	----
Belmore loam, 6 to 12 percent slopes	55	80	18	28	45	65	30	43	2.4	4.0	----	----
Blount loam, 0 to 2 percent slopes	80	110	33	45	60	80	33	45	3.0	5.0	18	11
Blount loam, 2 to 6 percent slopes	75	105	30	40	60	80	33	45	3.0	5.0	18	11
Blount silt loam, 0 to 2 percent slopes	80	110	33	45	60	80	33	45	3.0	5.0	18	12
Blount silt loam, 2 to 6 percent slopes	75	105	30	40	60	80	33	45	3.0	5.0	18	12
Blount silt loam, 2 to 6 percent slopes, moderately eroded	75	110	28	38	55	75	40	50	3.0	5.0	----	----
Colwood silt loam	89	130	30	45	65	90	45	55	3.0	5.0	30	23
Defiance silt loam [1]	64	95	22	30	50	65	23	36	3.0	4.5	14	10
Defiance silty clay loam [1]	62	95	22	30	48	65	22	36	3.0	4.5	14	10
Digby sandy loam, 0 to 2 percent slopes	80	120	33	43	65	85	40	48	3.0	5.0	20	13
Digby sandy loam, 2 to 6 percent slopes	80	120	33	43	65	85	40	48	3.0	5.0	20	13
Digby loam, 0 to 2 percent slopes	80	120	33	43	65	85	40	48	3.0	5.0	20	13
Digby loam, 2 to 6 percent slopes	80	120	33	43	65	85	40	48	3.0	5.0	20	13
Eel silt loam [1]	80	115	28	40	50	76	38	48	3.0	5.0	20	14
Elliott silt loam, 0 to 4 percent slopes	75	115	28	37	55	80	28	40	3.0	5.0	17	11
Haney sandy loam, 2 to 6 percent slopes	65	95	30	40	60	80	43	55	3.0	5.0	18	12
Haney loam, 0 to 2 percent slopes	70	110	30	40	60	85	43	55	3.0	5.0	19	13
Haney loam, 2 to 6 percent slopes	70	110	30	40	60	85	43	55	3.0	5.0	19	13
Haskins fine sandy loam, 0 to 2 percent slopes	75	115	33	40	70	85	43	55	3.0	5.0	19	12
Haskins fine sandy loam, 2 to 6 percent slopes	75	115	33	40	70	85	43	55	3.0	5.0	19	12
Haskins loam, 0 to 2 percent slopes	100	120	33	40	70	85	43	55	3.0	5.0	20	13
Haskins loam, 2 to 6 percent slopes	75	120	33	40	70	85	43	55	3.0	5.0	20	13
Hoytville silty clay loam	82	120	31	42	72	90	32	48	3.0	5.0	29	22
Hoytville silty clay loam, moderately shallow variant	77	120	30	42	65	90	32	48	3.0	5.0	29	----
Hoytville clay	80	115	30	40	70	90	32	48	3.0	5.0	29	21
Kibbie silt loam	80	115	29	40	60	85	40	53	3.0	5.0	20	13
Latty silty clay loam	60	110	25	40	60	80	40	53	3.0	5.0	25	19

TABLE 1.—*Estimated average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Soybeans		Oats		Wheat		Alfalfa-grass		Tomatoes	Sugar beets
	A	B	A	B	A	B	A	B	A	B	B	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Latty clay	60	110	25	40	60	80	40	53	3.0	5.0	25	19
McGary silt loam	70	100	25	32	50	70	35	43	3.0	5.0	18	11
Mermill silt loam	100	130	35	45	74	90	43	45	3.0	5.0	27	22
Millgrove silt loam	100	130	35	45	75	90	38	55	3.0	5.0	30	23
Millgrove silty clay loam	100	130	35	45	72	90	38	55	3.0	5.0	29	23
Montgomery silty clay loam	85	130	32	46	70	100	30	50	3.0	5.0	29	22
Montgomery silty clay	85	130	31	45	65	95	28	46	3.0	5.0	29	21
Morley loam, 2 to 6 percent slopes	59	90	24	34	52	70	29	42	3.0	4.5	------	------
Morley silt loam, 2 to 6 percent slopes	60	90	25	35	50	70	28	40	3.0	4.5	------	------
Morley silt loam, 2 to 6 percent slopes, moderately eroded	60	90	20	33	40	70	28	40	2.5	4.0	------	------
Morley silt loam, 6 to 12 percent slopes, moderately eroded	60	90	18	31	38	67	28	40	2.5	4.0	------	------
Morley silt loam, 12 to 18 percent slopes, moderately eroded	45	75	------	------	36	65	20	33	2.5	4.0	------	------
Nappanee loam, 0 to 2 percent slopes	70	95	25	34	50	72	35	43	3.0	4.5	17	10
Nappanee silt loam, 0 to 2 percent slopes	70	95	24	32	50	71	35	43	3.0	4.5	17	10
Nappanee silt loam, 2 to 6 percent slopes	70	95	23	30	50	70	35	43	3.0	4.5	17	10
Nappanee silty clay loam, 0 to 2 percent slopes	60	90	22	28	50	70	35	43	3.0	4.5	17	10
Nappanee silty clay loam, 2 to 6 percent slopes	60	90	21	30	50	70	35	43	3.0	4.5	17	10
Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	55	85	19	27	45	65	33	40	2.5	4.0	------	------
Pewamo silty clay loam	90	130	33	44	65	85	40	53	3.0	5.0	28	21
Pewamo silty clay	85	125	33	44	65	85	40	53	3.0	5.0	27	20
Rawson loam, 2 to 6 percent slopes	65	105	27	38	60	85	28	48	3.0	4.5	18	13
St. Clair silt loam, 2 to 6 percent slopes	60	90	24	33	50	75	30	40	2.5	4.5	------	------
St. Clair silt loam, 6 to 12 percent slopes, moderately eroded	50	80	18	30	35	65	20	35	2.0	4.0	------	------
Shoals silt loam [1]	80	105	28	38	50	75	28	40	3.0	5.0	16	12
Sloan silty clay loam [1]	80	125	28	45	50	80	28	44	3.0	5.0	24	19
Toledo silty clay	90	130	35	40	65	85	35	48	3.0	5.0	27	21
Wabasha silty clay loam [1]	80	120	30	45	60	85	28	44	3.0	5.0	24	17
Wabasha silty clay loam, moderately shallow variant [1]	70	105	28	40	55	80	25	40	3.0	5.0	23	------
Wabasha silty clay [1]	75	110	30	45	60	85	28	44	3.0	5.0	23	16

[1] Subject to flooding, but for the yields in the B columns, it is assumed that the flooding has not damaged the crops.

The yields listed in columns A are those that can be expected under the prevailing level of improved management, and those in columns B are estimates of yields to be expected under a high level of management. The estimated yields of sugar beets and tomatoes are listed only in columns B because a high level of management is needed to successfully produce these special crops.

A high level of management includes the following: Increasing the water-intake rate and the available moisture capacity of the soils; removing excess water; controlling erosion; plowing, preparing the seedbed, and cultivating by methods suited to the soil and the crop; controlling weeds and insects; applying fertilizer that contains needed trace elements, and lime, according to the results of soil tests; conducting all farming operations at the proper time; and choosing improved crop varieties. Irrigation is not included.

Under improved management, the level of management prevailing in the county, one or more of these practices is lacking or is not applied adequately.

Woodland and Windbreaks

During the early years of settlement, Van Wert County was almost entirely woodland. Most of it was covered by swampy, deciduous forest. At present, less than 10 percent is woodland. Remnants of the forest remain in undrained areas of Pewamo, Hoytville, Toledo, and other very poorly drained soils and in areas of sloping soils that are not used for farming. There is also woodland along most of the streams and drainageways.

As the remaining woodland is cleared, windbreaks become more important, particularly in this county where the topography is nearly level. In spring, before an adequate cover of plants has become established, the soils of the beach ridges tend to blow. Field windbreaks help to control soil blowing in spring, as well as helping to slow down the drying winds in summer. They also help to keep

the snow from drifting in winter. Austrian pine, arborvitae, and white pine make effective components of windbreaks and are suited to many of the soils.

The potential productivity of woodland is indicated in table 2, which gives the site index and estimates of average yearly growth for upland oaks on soils of several different series. Site index is the average height, in feet, of the dominant and codominant trees at 50 years of age. Data on potential productivity that pertain directly to the soils of Van Wert County are limited. The data in table 2 represent measurements of trees on soils of the county and on soils of the same series in counties nearby. They are based on data published in USDA Technical Bulletin 560 (7); the estimates of average yearly growth are for trees grown in an 80-year rotation.

TABLE 2.—*Potential productivity of upland oaks on specified soils*

Soil series	Number of plots sampled	Site index	Estimated average yearly growth per acre
			Board feet [1]
Blount	3	65–75	265
Eel	(2)	85+	380
Haney	(2)	75–85	340
Hoytville	6	65–75	280
Morley	2	75–85	340
Nappanee	(2)	65–75	280
Pewamo	1	65–75	280
St. Clair	(2)	65–75	280
Toledo	(2)	65–75	280

[1] According to International ¼-inch rule.
[2] No data available; estimates based on data from similar soils in adjacent counties

TABLE 3.—*Suitability of the soils for elements of*

[Suitability ratings are based on the degree of natural drainage. The

Soil series and map symbols	Elements of wildlife habitat: Grain and seed crops	Grass and legumes	Wild herbaceous upland plants	Hardwood woody plants
Belmore: BlB, BmA, BmB, BmC	Well suited	Well suited	Well suited	Well suited
Blount: BnA, BoA	Suited	Suited	Well suited	Well suited
BnB, BoB, BoB2	Suited	Suited	Well suited	Well suited
Colwood: Cw	Unsuited	Poorly suited	Suited	Well suited
Defiance: De, Df	Suited	Suited	Suited	Well suited
Digby: DgA, DmA	Suited	Suited	Well suited	Well suited
DgB, DmB	Suited	Suited	Well suited	Well suited
Eel: Em	Suited	Well suited	Well suited	Well suited
Elliott: EoB	Suited	Suited	Well suited	Well suited
Haney: HaB, HdA, HdB	Well suited	Well suited	Well suited	Well suited
Haskins: HkA, HnA	Suited	Suited	Well suited	Well suited
HkB, HnB	Suited	Suited	Well suited	Well suited
Hoytville: Ho, Hv	Unsuited	Poorly suited	Poorly suited	Well suited
Hoytville, moderately shallow variant: Hs	Unsuited	Poorly suited	Poorly suited	Well suited
Kibbie: Ks	Suited	Suited	Well suited	Well suited
Latty: La, Lc	Unsuited	Poorly suited	Poorly suited	Well suited
McGary: Mc	Suited	Well suited	Well suited	Well suited
Mermill: Md	Unsuited	Poorly suited	Poorly suited	Well suited
Millgrove: Me, Mg	Unsuited	Poorly suited	Poorly suited	Well suited
Montgomery: Mm, Mn	Unsuited	Poorly suited	Poorly suited	Well suited

Wildlife

Successful management of wildlife habitat depends on the availability of food, cover, and water. Unless the habitat provides a favorable balance and an adequate distribution of these elements, some desirable wildlife species will be scarce or will seek favorable habitat elsewhere. The habitat for most wildlife can be improved by establishing suitable plantings; by manipulating the existing vegetation so that the natural establishment of plants is induced and the number of desirable plants is increased; and by improving the water supply.

The soil-wildlife interpretations in this section can be useful in selecting the more suitable sites for various kinds of wildlife habitat; in indicating the level of management intensity needed for satisfactory results; in showing why it is not generally feasible to manage a particular area for a given kind of wildlife; and in the broadscale planning for wildlife management areas, parks, and nature study areas.

The suitability of the soils for elements of wildlife habitat (*1*) and for kinds of wildlife is shown in table 3. The ratings are based on limitations imposed by soil properties. Among these properties are natural drainage, slope, and the available moisture capacity. The size, shape, and location of soil areas have not been considered, although these features should be considered when planning the development of a specific tract for wildlife habitat. The effects of such features as elevation and aspect necessitate onsite appraisal. Artificial drainage has not been considered, because artificially drained soils are generally not developed specifically for wildlife habitat.

wildlife habitat and kinds of wildlife

ratings for Clay pits (Cp), Cut and fill land (Cx), and Quarry (Qu) are not shown]

Elements of wildlife habitat—Continued				Suitability for wildlife that find habitat in—		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Openland	Woodland	Wetland
Poorly suited	Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Unsuited	Unsuited	Well suited	Suited	Unsuited.
Well suited	Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Suited	Suited	Suited	Unsuited	Suited	Well suited	Unsuited.
Suited	Suited	Suited	Unsuited	Well suited	Suited	Suited.
Suited	Poorly suited	Poorly suited	Unsuited	Well suited	Suited	Poorly suited.
Poorly suited	Unsuited	Poorly suited	Poorly suited	Well suited	Well suited	Unsuited.
Poorly suited	Poorly suited	Unsuited	Unsuited	Well suited	Suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Well suited	Suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Suited	Suited	Unsuited	Poorly suited	Well suited	Suited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Well suited	Suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Poorly suited	Suited	Suited	Poorly suited	Well suited	Suited	Poorly suited.
Well suited	Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.

TABLE 3.—*Suitability of the soils for elements of*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants	Hardwood woody plants
Morley:				
MoB, MrB, MrB2	Well suited	Well suited	Well suited	Well suited
MrC2	Suited	Well suited	Well suited	Well suited
MrD2	Poorly suited	Suited	Well suited	Well suited
Nappance:				
NaA, NpA, NtA	Suited	Suited	Suited	Well suited
NpB, NtB, NtB2	Suited	Suited	Suited	Well suited
Pewamo: Pm, Po	Unsuited	Poorly suited	Poorly suited	Well suited
Rawson: RmB	Well suited	Well suited	Well suited	Well suited
St. Clair: ScB, ScC2	Suited	Suited	Suited	Well suited
Shoals: Sh	Suited	Suited	Well suited	Well suited
Sloan: So	Unsuited	Poorly suited	Poorly suited	Well suited
Toledo: To	Unsuited	Poorly suited	Poorly suited	Well suited
Wabasha: Wa, Wh	Unsuited	Poorly suited	Poorly suited	Well suited
Wabasha, moderately shallow variant: Wb	Unsuited	Poorly suited	Poorly suited	Suited

Four levels of suitability are recognized—well suited, suited, poorly suited, and unsuited. These ratings are defined in the following paragraphs:

Well suited means that there are few or no soil limitations for the particular element of habitat.

Suited means that the element of habitat can be created, improved, or maintained, but there are moderate soil limitations.

Poorly suited means that the element of habitat can be created, improved, or maintained, but there are severe soil limitations.

Unsuited means that creating, improving, or maintaining the habitat is not possible or not feasible.

Grain and seed crops that are valuable for wildlife include corn, dwarf grain sorghum, soybeans, oats, barley, rye, and wheat.

Legumes and grasses that are good for wildlife food and cover include alfalfa, Ladino clover, orchardgrass, red clover, fescue, reed canarygrass, bromegrass, bluegrass, switchgrass, and timothy.

Wild herbaceous upland plants include foxtail, giant foxtail, ragweed, smartweed, panicgrass, wild oats, and native herbs.

Hardwood woody plants are trees and shrubs, including sumac, wild grape, wild crabapple, dogwood, persimmon, multiflora rose, blackhaw, sweetgum, wild cherry, hawthorn, oak, hickory, and walnut. Suitability for these is based on the rate of growth and the size of the fruit or seed crop. Good growth and a large crop are desirable.

Coniferous woody plants include eastern redcedar, Virginia pine, Scotch pine, and Austrian pine. Suitability for these woody plants is based on slowness of growth and delay in closure of the canopy. Slow growth is desirable in conifers used for wildlife food and cover.

Wetland food and cover plants that are valuable for wildlife include cattails, sedges, reeds, bulrushes, barnyard grass, duckweed, smartweed, and various willows.

Shallow-water developments include impoundments, excavations, and controlled areas where the water is generally not more than 5 feet deep.

Excavated ponds refer to larger excavations that average 8 feet deep over at least a fourth of the area. The quality of the water is suitable for the production of fish and wildlife.

Examples of openland wildlife are quail, pheasants, meadowlarks, cottontail rabbits, red foxes, and woodchucks.

Woodland wildlife include squirrels, raccoons, woodcocks, and various songbirds.

Wetland wildlife include ducks, geese, rails, herons, and other waterfowl, as well as muskrats.

Engineering Uses of the Soils [2]

Some soil properties are of particular interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, irrigation and drainage systems, and sewage disposal systems. Among the soil properties most important to engineers are

[2] Reviewed by LLOYD GILLOGLY, construction engineer, Soil Conservation Service, Columbus.

wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued				Suitability for wildlife that find habitat in—		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Openland	Woodland	Wetland
Poorly suited	Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Poorly suited	Suited	Suited	Suited	Well suited	Suited	Suited.
Poorly suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Suited	Poorly suited.
Well suited	Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Poorly suited	Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Poorly suited	Suited	Suited	Poorly suited	Well suited	Suited	Suited.
Well suited	Suited	Suited	Unsuited	Poorly suited	Well suited	Poorly suited.
Well suited	Suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Well suited	Suited	Suited	Unsuited	Poorly suited	Well suited	Suited.
Well suited	Suited	Suited	Unsuited	Poorly suited	Well suited	Suited.

permeability, shear strength, compaction characteristics, drainage, shrink-swell characteristics, dispersion, grain size, plasticity, and reaction. Depth to the water table, depth to bedrock, available water capacity, and topography are also important.

Results of tests on soil samples are given in table 4, estimates of the soil properties significant in engineering are in table 5, and interpretations relating to engineering uses of the soils are in table 6. The estimates and interpretations of soil properties in these tables can be used to—

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of soil properties that are significant in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structures with soil mapping units to develop information for overall planning that will be useful in designing and maintaining engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used in this publication, for example, sand, silt and clay, have a special meaning to soil scientists and a different meaning to engineers. These terms and others are defined in the Glossary.

Engineering classification systems

Two systems of classifying soils are in general use among engineers. Most highway engineers classify soil material according to the system used by the American Association of State Highway Officials (AASHO) (*2*). This system is based on grain-size distribution, liquid limit, plasticity index, and field performance of soils in highways. In the AASHO system, soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils having high bearing strength (the best soils for road subgrade), to A–7, which consists of clayey

soils having low strength when wet (the poorest soils for road subgrade). Within each group, the relative engineering value of a soil is indicated by group index numbers that range from 0 for the best material to 20 for the poorest. The group index number is given in parentheses after the symbol, for example, A-4(7).

Some engineers prefer to use the Unified classification system established by the Department of Defense (*14*). In this system the soils are identified as coarse grained (eight classes), fine grained (six classes), and highly organic (one class). The symbols used to identify coarse-grained material are GW, GP, GM, GC, SW, SP, SM, and SC; those used to identify fine-grained material are ML, CL, OL, MH, CH, and OH; and the symbol used to identify highly organic material is Pt. Soils on the borderline between two classifications are given a joint classification, for example, ML-CL.

Engineering test data

To help evaluate the soils for engineering purposes, samples from four profiles representing four of the soil series in Van Wert County were tested in accordance with standard procedures. Only selected layers of each soil were tested. The results of these tests are given in table 4.

Table 4 gives moisture density data for the tested soils. If a soil material is compacted at successively higher moisture content and the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density obtained in the compaction test is termed maximum dry density, and the corresponding moisture content is the optimum moisture. Moisture-density data are important in earthwork because, as a rule, soil is most stable if it is compacted to about the maximum dry density at approximately optimum moisture content.

The percentage passing the various sieves was obtained by combined sieve and hydrometer methods. The percentage of clay obtained by the hydrometer method should not be used in naming textural classes of soils.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content, expressed as a percentage of the ovendry weight of the soil, at which the soil material passes from semisolid to plastic. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is plastic. Some sandy soils are nonplastic; that is, they do not become plastic at any moisture content.

Estimated properties

Table 5 shows estimates of some of the soil properties that affect engineering work. Although observed during

TABLE 4.—*Engineering*

[Tests performed by the Ohio Department of Highways in accordance with standard

Soil name and location	Parent material	Ohio report No.	Depth from surface	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
Blount silt loam:			*In.*	*Lb. per cu. ft.*	*Pct.*
NE¼SW¼ sec. 2, Harrison Township (modal)	Glacial till.	720	0–8	107	18
		721	15–26	102	20
		722	32–40	110	17
Haney sandy loam:					
SW¼SW¼ sec. 11, Ridge Township (finer textured than modal at a depth below 44 inches).	Beach-ridge deposits.	----------	0 10	120	11
		90071	10–44	117	14
		90072	44–62	107	18
Nappanee silt loam:					
NE¼NE¼ sec. 33, Jackson Township (modal)	Glacial till.	33929	0–9	108	18
		33930	9–19	103	18
		33931	19–84	112	16
Toledo silty clay:					
NE¼NW¼ sec. 2, Harrison Township (modal)	Lacustrine sediments over glacial till.	717	0–7	93	25
		718	21–28	99	22
		719	79–105	109	18

[1] Based on AASHO Designation T 99-57, Method A (*2*).

[2] Analysis according to AASHO Designation T 88 (*2*). Results by this procedure differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in determining the textural classes of soils.

the course of the survey, the depth to bedrock is not given in this table, because it is more than 5 feet in all the soils, except the moderately shallow variants of Hoytville and Wabasha soils. Bedrock is at a depth of 20 to 40 inches in these variants. The estimates in this table are based on laboratory tests and on field experience in Van Wert County and in other counties having the same kinds of soil. Some of the column headings are discussed briefly in the following paragraphs.

The seasonal high water table, which may be a perched water table, is the highest level at which the soil is saturated in winter and spring. In summer and fall it is generally lower than is shown in table 5. Saturation of the soils immediately after heavy rainfall was not considered.

The depth from surface is the depth at which significant changes in texture occur. The depths correspond to the ones shown in the representative profile described in the section "Descriptions of the Soils." The depths within other soils of the same series may not be exactly the same.

The estimated rates of permeability are the rates at which water moves downward through soil that is saturated above the true water table and allowed to drain freely. These estimates are based on texture, structure, porosity, and observations of drainage as well as tests for permeability and infiltration. Within soils of the same series that have the same texture in the surface layer, the rate of infiltration (percolation through the surface layer) varies considerably with use and management of the soil, as well as with the initial moisture condition.

The available moisture capacity refers to the maximum amount of moisture that a particular soil can store in a form available to plants. Expressed in inches per inch of soil, it is the approximate amount of capillary water in a soil that is wet to field capacity. In air-dry soil, this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation. The estimates in table 5 are based on the difference in percentage of moisture retained between 1/3 atmosphere and 15 atmospheres of tension in medium-textured and fine-textured soils and between 1/10 atmosphere and 15 atmospheres in sandy soils. In layers of dense clay or compact glacial till, the figures are lower than are normal for the given texture, because in these layers, increased bulk density greatly reduces the penetration of plant roots and the storage of water.

Reaction shows the degree of acidity or alkalinity of the soil. Estimates are based on the results of many field tests made to determine pH value. The pH values are defined in the Glossary under the heading "Reaction, soil." If limed, the surface layer may have a higher pH value than is shown in table 5.

Shrink-swell potential indicates the volume change to be expected when soil material changes in moisture content. A high shrink-swell potential is a serious limitation for many engineering uses.

The corrosion potential for uncoated steel is based on texture, drainage, and total acidity of the soil, but electrical resistivity has not been considered. For concrete, it is

test data

procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Percentage passing sieve—[2]					Percentage smaller than 0.005 mm.	Liquid limit	Plasticity index	Classification		
⅜-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				AASHO [3]	Unified [4]	Ohio [5]
						Pct.				
100	99	95	86	69	33	25	4	A-4(7)	ML-CL	A-4a
----------	100	94	90	82	49	46	22	A-7-6(14)	CL	A-7-6
----------	100	95	91	81	73	36	20	A-6(12)	CL	A-6b
100	97	95	84	36	----------	(6)	(6)	A-4(0)	SM	A-4a
100	96	85	64	30	19	28	11	A-2-6(0)	SC	A-2-6
95	83	72	57	40	22	43	21	A-7-6(4)	SC	A-7-6
----------	----------	100	93	77	37	30	11	A-6(9)	CL	A-6a
----------	100	98	95	88	52	53	27	A-7-6(17)	CH	A-7-6
98	92	89	84	76	47	40	19	A-6(12)	CL	A 6b
----------	----------	----------	100	98	66	48	17	A-7-5(12)	ML	A-7-5
----------	----------	----------	100	98	69	50	28	A-7-6(17)	CH	A-7-6
99	99	93	89	79	59	34	11	A-6(8)	ML-CL	A-6a

[3] Based on AASHO Designation M 145-49 (*2*).

[4] Based on MIL-STD-619B (*14*). The SCS and the Bureau of Public Roads have agreed that any soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. ML-CL is an example of a borderline classification.

[5] Based on "Classification of Soils," Ohio State Highway Testing Laboratory. February 1, 1955.

[6] Nonplastic.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Classification USDA
	Feet	*Inches*					
Belmore: BlB, BmA, BmB, BmC. Surface layer in BlB is sandy loam.	4+	0–13	90–100	90–100	70–95	60–75	Loam
		13–29	90–100	90–100	65–85	60–75	Loam
		29–60	95–100	65–75	50–75	45–70	Gravelly clay loam to sandy clay loam.
		60–70	65–100	65–75	25–60	6–35	Gravelly sandy loam
Blount: BnA, BnB, BoA, BoB, BoB2.	½–1½	0–9	95–100	95–100	85–100	65–90	Silt loam
		9–16	95–100	95–100	90–100	85–95	Silty clay loam or clay loam
		16–28	95–100	95–100	90–100	80–95	Clay
		28–60	95–100	90–100	85–95	65–85	Clay loam
Clay pits: Cp. Properties too variable to estimate.							
Colwood: Cw	0–½	0–12	100	100	95–100	70–95	Silt loam
		12–20	100	100	90–100	70–95	Loam
		20–40	100	100	85–100	40–70	Fine sandy loam
		40–60	100	100	85–100	30–70	Stratified fine sand and silt
Cut and fill land: Cx. Properties too variable to estimate.							
Defiance: De, Df. Subject to flooding. Surface layer in De is silt loam.	0–½	0–8	100	100	95–100	85–95	Silty clay loam
		8–48	100	100	95–100	75–95	Silty clay or clay
Digby: DgA, DgB, DmA, DmB. Surface layer in DgA, and DgB is sandy loam.	½–1½	0–9	95–100	90–100	70–95	60–75	Loam
		9–17	95–100	90–100	65–85	70–80	Clay loam
		17–35	90–100	85–100	50–75	40–55	Sandy clay loam
		35–60	65–100	65–75	25–60	10–40	Silty sand and gravel
Eel: Em. Subject to flooding.	1½–3	0–30	100	90–100	85–100	70–95	Silt loam
		30–48	100	90–100	75–95	60–85	Loam
Elliott: EoB	½–1½	0–11	95–100	95–100	85–95	70–90	Silt loam
		11–18	95–100	95–100	90–100	85–95	Silty clay loam
		18–27	95–100	95–100	90–100	85–95	Silty clay
		27–60	95–100	80–100	75–95	65–85	Clay loam
Haney: HaB, HdA, HdB. Surface layer in HaB is sandy loam.	1½–3	0–18	95–100	90–100	70–95	60–75	Loam
		18–36	95–100	90–100	65–85	60–75	Clay loam
		36–50	65–100	65–75	25–60	6–35	Silty sand and gravel
Haskins: HkA, HkB, HnA, HnB. Surface layer in HkA and HkB is fine sandy loam.	½–1½	0–14	95–100	90–100	80–95	60–75	Loam
		14–32	90–100	85–100	75–90	40–70	Sandy clay loam to clay loam
		32–38	95–100	90–100	85–100	85–95	Silty clay
		38–60	95–100	80–100	75–90	65–85	Clay loam
Hoytville: Ho, Hv. Surface layer in Ho is silty clay loam.	0–½	0–8	100	90–100	90–100	90–100	Clay
		8–48	100	90–100	90–100	90–100	Silty clay or clay
		48–68	90–100	85–100	85–95	80–95	Clay
Hoytville, moderately shallow variant: Hs. Limestone bedrock at a depth of 20 to 40 inches.	0–½	0–9	100	90–100	90–100	90–100	Silty clay loam
		9–32	100	90–100	90–100	90–100	Silty clay
Kibbie: Ks	½–1½	0–15	100	100	90–100	70–90	Silt loam to loam
		15–35	100	100	90–100	80–95	Silty clay loam
		35–60	100	100	90–100	70–90	Silt loam
Latty: La, Lc. Surface layer in La is silty clay loam.	0–½	0–42	100	100	100	90–100	Clay
		42–60	100	95–100	95–100	90–100	Clay

properties of soils

Classification—Continued		Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential to—	
Unified	AASHO					Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML	A–4	2.0–6.3	0.14–0.18	5.6–6.5	Low		Low to moderate.
ML	A–4	2.0–6.3	0.12–0.18	5.6–6.5	Low	Low	Low to moderate.
CL, SC	A–6	2.0–6.3	0.12–0.16	5.6–7.3	Low to moderate	Low	Low to moderate.
SM, SW–SM	A–1, A–2, A–3	6.3+	0.08–0.12	[1]7.4–8.4	Low	Low	Low.
ML, ML–CL	A–4	0.63–2.0	0.16–0.20	5.1–6.0	Low		Moderate.
CL	A–6	0.2–0.63	0.15–0.19	4.6–5.5	Moderate	High	High.
CH, ML–CL	A–7	0.06–0.2	0.13–0.15	6.1–6.5	High	High	Moderate.
CL	A–6	0.06–0.2	0.07–0.10	7.4–8.4	Moderate	High	Low.
ML	A–4	0.63–2.0	0.18–0.22	6.6–7.3	Low		Low.
ML	A–4	0.63–2.0	0.14–0.18	6.6–7.3	Low	High	Low.
ML–CL, SM	A–4	0.63–2.0	0.12–0.15	6.6–7.3	Low	High	Low.
ML–CL, SM	A–4, A–2	0.63–2.0	0.12–0.18	[1]7.4–8.4	Low	High	Low.
ML–CL	A–6, A–7	0.2–0.63	0.17–0.23	6.1–6.5	Moderate		Low.
CH, ML–CL	A–7	0.06–0.2	0.13–0.15	6.6–7.8	High	High	Low.
ML	A–4	0.63–2.0	0.13–0.19	6.1–6.5	Low		Low.
CL	A–6	0.63–2.0	0.15–0.19	4.6–5.5	Moderate	High	Moderate.
SC, CL	A–6	0.63–2.0	0.15–0.19	5.1–6.0	Moderate	High	Moderate.
SW–SM, SM	A–1, A–3, A–4	0.63–2.0+	0.12–0.16	[1]7.4–7.8	Low	High	Low.
ML–CL, ML	A–4, A–6	0.63–2.0	0.16–0.22	6.1–7.3	Low to moderate	Moderate	Low.
ML–CL, ML	A–4, A–6	0.63–2.0	0.14–0.18	6.6–7.3	Low to moderate	Moderate	Low.
ML, ML–CL	A–4	0.63–2.0	0.17–0.22	5.6–6.5	Low		Moderate.
CL	A–6	0.2–0.63	0.15–0.19	5.6–6.5	Moderate	High	Moderate.
CH, ML–CL	A–7	0.06–0.2	0.13–0.15	6.6–7.3	High	High	Low.
CL	A–6	0.06–0.2	0.07–0.09	[1]7.4–8.4	Moderate	High	Low.
ML	A–4	0.63–2.0	0.16–0.20	5.6–6.5	Low		Low.
CL	A–6	0.63–2.0	0.15–0.19	5.1–6.5	Moderate	Moderate	Moderate.
SM	A–1, A–2, A–3	0.63–2.0	0.12–0.16	[1]7.4–8.4	Low	Moderate	Low.
ML, ML–CL	A–4	0.63–2.0	0.16–0.20	5.1–5.5	Low		Moderate.
SC, CL	A–4, A–6	0.63–2.0	0.15–0.18	5.1–7.3	Moderate	High	Moderate to low.
CL, CH	A–6, A–7	0.06–0.2	0.13–0.15	6.6–7.3	Moderate	High	Low.
CL	A–6	0.06–0.2	0.07–0.09	[1]7.4–8.4	Moderate	High	Low.
MH, ML–CL	A–6, A–7	0.2–0.63	0.16–0.20	6.6–7.3	High		Low.
CH, CH–MH, ML–CL	A–7	0.2–0.63	0.13–0.15	6.6–7.3	High	High	Low.
CH–MH, ML–CL, CH	A–7	0.06–0.2	0.06–0.08	[1]7.4–7.8	Moderate to high	High	Low.
ML–CL	A–6, A–7	0.2–0.63	0.16–0.20	6.6–7.3	High		Low.
CH, MH–CH, ML–CL	A–7	0.2–0.63	0.13–0.15	6.6–7.3	High	High	Low.
ML, ML–CL	A–4	0.63–2.0	0.17–0.20	6.1–6.5	Low		Low.
CL, ML–CL	A–6	0.63–2.0	0.16–0.19	5.6–7.3	Moderate	High	Low.
ML, CL	A–4, A–6	0.63–2.0	0.17–0.20	[1]7.4–8.4	Low	High	Low.
CH, MH–CH	A–7	0.06–0.2	0.13–0.15	6.6–7.3	High	High	Low.
CH, MH–CH, ML–CL	A–7	0.06–0.2	0.06–0.08	[1]7.4–7.8	High	High	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Classification USDA
	Feet	*Inches*					
McGary: Mc	½–1½	0–16	100	90–100	80–95	70–90	Silt loam
		16–21	100	90–100	85–95	80–95	Silty clay loam
		21–45	100	90–100	90–100	90–100	Silty clay
		45–60	100	90–100	90–100	85–95	Stratified silty clay loam, silt loam, and silty clay.
Mermill: Md	0–½	0–9	100	100	85–100	65–85	Silt loam
		9–36	100	90–100	80–90	45–80	Clay loam to sandy clay loam
		36–60	100	85–100	80–95	75–90	Clay loam to clay
Millgrove: Me, Mg. Surface layer in Mg is silty clay loam.	0–½	0–13	90–100	85–100	75–95	70–90	Silt loam to loam
		13–44	90–100	80–95	65–85	40–80	Clay loam to sandy clay loam
		44–60	65–100	65–75	25–60	20–55	Gravelly sandy loam
Montgomery: Mm, Mn. Surface layer in Mm is silty clay loam.	0–½	0–64	100	100	95–100	75–100	Silty clay
Morley: MoB, MrB, MrB2, MrC2, MrD2. Surface layer in MoB is loam.	1½–3	0–8	95–100	95–100	90–100	75–85	Silt loam
		8–13	95–100	95–100	90–100	80–95	Silty clay loam
		13–26	95–100	95–100	90–100	85–95	Silty clay to clay
		26–60	95–100	95–100	85–95	70–85	Clay loam
Nappanee: NaA, NpA, NpB, NtA, NtB, NtB2. Surface layer in NaA is loam and in NtA, NtB, and NtB2 is silty clay loam.	½–1½	0–9	100	100	90–100	75–90	Silt loam
		9–19	100	95–100	90–100	80–95	Clay
		19–60	95–100	85–100	85–95	75–90	Clay
Pewamo: Pm, Po. Surface layer in Po is silty clay.	0–½	0–12	100	100	90–100	80–95	Silty clay loam
		12–54	95–100	90–100	90–100	80–95	Silty clay or clay
		54–70	90–100	80–95	75–90	70–85	Clay loam
Quarry: Qu. Properties too variable to estimate.							
Rawson: RmB	1½–3	0–18	90–100	90–100	85–90	40–75	Loam
		18–31	85–95	80–90	75–90	35–70	Sandy clay loam to clay loam
		31–60	95–100	90–100	80–95	70–80	Clay loam to clay
St. Clair: ScB, ScC2	1½–3	0–7	100	100	85–100	75–90	Silt loam
		7–16	100	95–100	90–100	80–95	Clay or silty clay
		16–60	100	90–100	85–95	75–90	Clay
Shoals: Sh. Subject to flooding.	0–½	0–24	100	100	85–100	60–80	Silt loam
		24–48	100	100	85–100	80–90	Silty clay loam
Sloan: So. Subject to flooding.	0–½	0–36	100	90–100	90–100	85–95	Silty clay loam
		36–50	85–100	85–95	75–90	60–90	Stratified sand, silt, and clay
Toledo: To	0–½	0–8	100	100	90–100	85–100	Silty clay
		8–42	100	100	90–100	85–95	Silty clay
		42–60	100	100	90–100	90–100	Silty clay
Wabasha: Wa, Wh. Subject to flooding. Surface layer in Wh is silty clay.	0–½	0–9	100	100	90–100	80–90	Silty clay loam
		9–60	100	100	90–100	85–95	Silty clay
Wabasha, moderately shallow variant: Wb. Subject to flooding. Limestone bedrock at a depth of 20 to 40 inches.	0–½	0–9	100	100	90–100	80–90	Silty clay loam
		9–30	100	100	90–100	85–95	Silty clay

[1] Calcareous.

properties of soils—Continued

Classification—Continued: Unified	AASHO	Permeability	Available moisture capacity	Reaction	Shrink-swell potential	Corrosion potential to—: Steel	Concrete
		Inches per hour	*Inches per inch of soil*	*pH*			
ML, ML-CL	A-4	0. 2-0. 63	0. 17-0. 20	5. 6-6. 5	Low		Moderate to low.
CL, ML-CL	A-6, A-7	0. 2-0. 63	0. 16-0. 19	6. 1-6. 5	Moderate	High	Low.
CH, ML-CL	A-7	0. 06 0. 2	0. 13-0. 15	6. 6-7. 3	High	High	Low.
CL, CH	A-6, A-7	0. 06-0. 2	0. 16-0. 19	[1] 7. 4-7. 8	Moderate to high	High	Low.
ML, ML-CL	A-4	0. 63-2. 0	0. 18-0. 22	6. 6-7. 3	Low		Low.
CL, ML-CL, SC	A-4, A-6	0. 63-2. 0	0. 16-0. 19	6. 6-7. 3	Moderate	High	Low.
CL, ML-CL, CH	A-6, A-7	<0. 06-0. 2	0. 07-0. 09	[1] 7. 4-8. 4	Moderate	High	Low.
ML	A-4	0. 63-2. 0	0. 18-0. 22	6. 1 7. 3	Low		Low.
CL, SC	A-6	0. 63 2. 0	0. 16-0. 19	6. 6-7. 3	Moderate	High	Low.
SM, ML, GM	A-2, A-4	6. 3+	0. 10-0. 16	[1] 7. 4-8. 4	Low	High	Low.
ML, ML-CL, CH	A-7, A-6	<0. 06-0. 2	0. 14-0. 16	[1] 6. 6-7. 8	High	High	Low.
ML, ML-CL	A-4	0. 2-0. 63	0. 17-0. 20	6. 1-6. 5	Low		Moderate.
CL, ML-CL	A-6	0. 2-0. 63	0. 16-0. 19	5. 1 6. 0	Moderate	Moderate to high	Moderate.
CL, ML-CL, CH	A-7	0. 06-0. 2	0. 13-0. 15	5. 6-7. 3	Moderate to high	High	Moderate.
CL	A-6	0. 06-0. 2	0. 07-0. 10	[1] 7. 4 8. 4	Moderate	High	Low.
CL, ML-CL	A-4, A-6	0. 2-0. 63	0. 17-0. 20	6. 6-7. 3	Low		Low.
CL, CH	A 7	<0. 06-0. 2	0. 13-0. 15	5. 1-7. 3	High	High	Moderate.
CL, CH	A-6, A-7	<0. 06-0. 2	0. 07-0. 10	[1] 7. 4-8. 4	Moderate	High	Low.
ML, MH, ML-CL	A-6, A-7	0. 63-2. 0	0. 17-0. 22	6. 6-7. 3	Moderate		Low.
ML-CL, CH	A-6, A-7	0. 2-0. 63	0. 13-0. 15	6. 6-7. 3	High	High	Low.
CL	A-6	0. 06-0. 2	0. 07-0. 10	[1] 7. 4 8. 4	Moderate	High	Low.
ML, SM	A-4	0. 63-2. 0	0. 14-0. 18	5. 1 6. 5	Low		Moderate.
SC, CL	A-4	0. 63 2. 0	0. 15-0. 18	5. 1-7. 3	Moderate	High	Low.
CL, ML	A-6	<0. 06-0. 2	0. 07-0. 09	[1] 7. 4-8. 4	Moderate	High	Low.
CL, ML-CL	A-4, A-6	0. 2-0. 63	0. 17-0. 20	6. 1-6. 5	Low		Low.
CL, CH	A-7	<0. 06-0. 2	0. 13-0. 15	5. 6-6. 5	High	High	Moderate.
CL, CH	A-6, A-7	<0. 06-0. 2	0. 06-0. 10	[1] 7. 4 8. 4	Moderate to high	High	Low.
ML, ML-CL	A-4, A-6	0. 63-2. 0	0. 17-0. 20	6. 6-7. 3	Low	High	Low.
ML, CL	A-4, A-6	0. 2-0. 63	0. 16-0. 19	6. 6-7. 3	Low	High	Low.
CL	A-6	0. 63-2. 0	0. 17-0. 22	6. 6-7. 3	Moderate	High	Low.
ML, CL	A-4, A-6	0. 2-0. 63	0. 17-0. 20	6. 6-7. 3	Low	High	Low.
MH-CH	A-7	0. 2-0. 63	0. 17 0. 22	6. 1-6. 5	High		Low.
CL, CH	A-7	0. 06-0. 2	0. 13-0. 15	6. 6-7. 3	High	High	Low.
CH, ML-CL	A-7, A-6	0. 06-0. 2	0. 13-0. 15	[1] 7. 4-7. 8	High	High	Low.
MH CH	A-7	0. 2-0. 63	0. 18-0. 22	6. 6-7. 3	High		Low.
CH	A-7	0. 06-0. 2	0. 13-0. 15	6. 6-7. 3	High	High	Low.
MH-CH	A-7	0. 2-0. 63	0. 18-0. 22	6. 6-7. 3	High		Low.
CH	A-7	0. 06-0. 2	0. 13-0. 15	6. 6-7. 3	High	High	Low.

TABLE 6.—*Engineer-*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability a a source of—				Soil features affecting—
			Topsoil	Sand and gravel	Road fill		Highway location
					Subsoil	Substratum	
Belmore: BlB, BmA, BmB, BmC.	Fair in surface layer and subsoil. Good in substratum.	Low to moderate.	Fair to good	Fair in substratum; high content of fine material in sand and gravel; good in places.	Fair to good	Good	Cut slopes are droughty.
Blount: BnA, BnB, BoA, BoB, BoB2.	Poor: seasonally wet; clayey material.	High	Fair: thin layer of suitable material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Seasonal high water table; clayey subsoil; slow permeability.
Clay pits: Cp. Features too variable for reliable evaluation.							
Colwood: Cw	Poor: very poorly drained.	High	Good	Not suitable.	Poor: high content of silt and very fine sand; flows when wet; very poor drainage.	Poor: high content of silt and very fine sand; flows when wet: very poor drainage.	Very poor natural drainage; high water table; moderate permeability; soft, compressible material; flows when wet.
Cut and fill land: Cx. Features too variable for reliable evaluation.							
Defiance: De, Df	Poor: seasonally wet; clayey material.	High	Fair: clayey material; thin layer.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Subject to flooding; somewhat poor natural drainage; slow permeability.
Digby: DgA, DgB, DmA, DmB.	Poor: seasonally wet.	Moderate	Fair: limited amount of suitable material.	Poor in most places: high content of fine material in sand and gravel of substratum. Fair to good in some places.	Fair: sandy clay loam material.	Fair to good: high content of fine material in sand and gravel.	Somewhat poor drainage; seasonal high water table; moderate permeability.

ing interpretations

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Well-drained soil; trench walls subject to caving.	Excessive seepage in substratum.	Good compaction characteristics and stability; permeable when compacted.	Well-drained soil	Moderate to rapid infiltration; medium available moisture capacity.	Permeable material; cut channels are droughty.	Cut areas are droughty; erodible slopes.
Seasonal high water table; clayey material.	Slow rate of seepage; seasonal high water table.	Fair compaction characteristics and stability; very slowly permeable when compacted; medium to high compressibility; high volume change.	Slow permeability; seasonal high water table.	Slow permeability; seasonal high water table.	Nearly level to gently sloping; moderately erodible channel.	Clayey material; seasonal high water table; moderately erodible channel.
Very fine sand and silty material; flows when wet; very poor drainage; trench walls subject to caving.	Moderate rate of seepage; high water table; pond banks unstable when wet.	Poor stability and compaction characteristics; permeable when compacted; limited clay content; susceptible to piping.	Very poor natural drainage; moderate permeability; high water table; flows when wet.	High available moisture capacity; very poor natural drainage; moderate permeability; high water table.	Nearly level; high water table.	Nearly level; high water table; erodible material.
Subject to flooding; clayey material.	Subject to flooding; generally slow rate of seepage.	Fair stability and compaction characteristics; very slowly permeable when compacted; high volume change; high compressibility.	Somewhat poor natural drainage; slow permeability; subject to flooding.	Somewhat poor natural drainage; slow infiltration and permeability; subject to flooding.	Nearly level; moderately erodible channel.	Nearly level; subject to flooding.
Seasonal high water table; trench walls subject to caving.	Excessive seepage; seasonal high water table.	Good compaction characteristics and stability; substratum is permeable when compacted.	Somewhat poor drainage; seasonal high water table; moderate permeability.	Somewhat poor drainage; seasonal high water table; moderate permeability; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel; seasonally wet.	Nearly level to gently sloping; moderately erodible channel; seasonally wet.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of— Topsoil	Sand and gravel	Road fill: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Eel: Em	Fair to poor: generally wet in winter.	Moderate	Good	Not suitable.	Fair to poor: silty material.	Fair to poor: silty material.	Subject to flooding; seasonal high water table for short periods.
Elliott: EoB	Poor: seasonally wet; clayey material.	High	Good	Not suitable.	Poor: clayey material.	Poor: clayey material.	Somewhat poor drainage; seasonal high water table; slow permeability.
Haney: HaB, HdA, HdB.	Fair: moderately well drained.	Moderate	Fair to good	Fair: high content of fine material in sand and gravel of substratum.	Fair: clay loam material.	Good: sandy and gravelly material.	Moderately well drained; moderate permeability; seasonal high water table for short periods.
Haskins: HkA, HkB, HnA, HnB.	Poor: generally wet in winter.	Moderate	Fair: limited amount of suitable material.	Not suitable.	Fair: sandy clay loam and clay loam material.	Poor: heavy clay loam.	Somewhat poor drainage; seasonal high water table; slow permeability in substratum.
Hoytville: Ho, Hv	Poor: very poorly drained.	High	Fair to poor: moderately clayey or clayey material; medium organic-matter content.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Clayey material; very poor drainage; seasonal high water table; slow permeability.
Hoytville, moderately shallow variant: Hs.	Poor: very poorly drained.	High	Fair to poor: moderately clayey or clayey material; medium organic-matter content.	Not suitable.	Poor: clayey material.	Poor: clayey material; limestone at a depth of 20 to 40 inches.	Clayey material; very poor drainage; seasonal high water table; slow permeability; limestone at a depth of 20 to 40 inches.

interpretations —Continued

Soil features affecting—Continued							
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Subject to flooding; seasonal high water table for short periods.	Subject to flooding; susceptible to seepage where substratum contains sandy layers; seasonal high water table for short periods.	Fair compaction characteristics and stability; moderate to slow permeability when compacted; susceptible to piping; subject to flooding.	Moderately well drained soil; moderate permeability; subject to flooding; seasonal high water table for short periods.	Moderate infiltration and permeability; high available moisture capacity; subject to flooding.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Seasonal high water table; clayey material.	Slow rate of seepage; seasonal high water table.	Fair compaction characteristics and stability; very slowly permeable when compacted; high volume change; medium to high compressibility.	Somewhat poor drainage; slow permeability; seasonal high water table.	Slow permeability; somewhat poor drainage; seasonal high water table.	Gently sloping; moderately erodible channel.	Gently sloping; moderately erodible channel.
Sandy and gravelly material in substratum; moderately well drained soil; trench walls subject to caving.	Excessive seepage..	Good compaction characteristics and stability; limited clay content; substratum is permeable when compacted.	Moderately well drained soil; moderate permeability.	Moderately rapid infiltration; moderate permeability; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel.	Nearly leve to gently sloping; moderately erodible channel.
Somewhat poor drainage; seasonal high water table.	Very slow rate of seepage; seasonal high water table.	Fair compaction characteristics and stability; very slowly permeable when compacted.	Somewhat poor drainage; seasonal high water table; moderate permeability in subsoil, and slow permeability in substratum.	Moderately rapid infiltration; moderate permeability in subsoil; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel.	Nearly level to gently sloping; moderately erodible channel.
Clayey material; very poor drainage; seasonal high water table.	Very slow rate of seepage; seasonal high water table.	Poor compaction characteristics; fair stability; slowly permeable when compacted; high volume change.	Very poor drainage; seasonal high water table; slow permeability.	Moderately slow infiltration; slow permeability; very poor drainage; seasonal high water table.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel.
Clayey material; very poor drainage; seasonal high water table; limestone at a depth of 20 to 40 inches.	Variable rate of seepage; seasonal high water table; limestone at a depth of 20 to 40 inches.	Poor compaction characteristics; fair stability; high volume change; limestone at a depth of 20 to 40 inches.	Very poor drainage; seasonal high water table; slow permeability; limestone at a depth of 20 to 40 inches.	Moderately slow infiltration; slow permeability; very poor drainage; seasonal high water table.	Nearly level; moderately erodible channel; limestone at a depth of 20 to 40 inches.	Nearly level; moderately erodible channel; limestone at a depth of 20 to 40 inches.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of—: Topsoil	Sand and gravel	Road fill: Subsoil	Road fill: Substratum	Soil features affecting—: Highway location
Kibbie: Ks	Poor: silty; generally wet in winter.	High	Good	Not suitable.	Poor: silty material; flows when wet.	Poor: silty material; flows when wet.	Somewhat poor drainage; seasonal high water table; moderate permeability; flows when wet
Latty: La, Lc	Poor: wet; clayey material.	High	Poor: clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Very poor drainage; seasonal high water table; very slow permeability.
McGary: Mc	Poor: wet; clayey material.	High	Fair: limited amount of suitable material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Somewhat poor drainage; seasonal high water table; slow permeability.
Mermill: Md	Poor: very poorly drained; generally wet in winter.	Moderate	Fair: limited amount of suitable material.	Not suitable.	Fair to poor: clay loam and clay material.	Poor: clayey material.	Very poor drainage; seasonal high water table; very slow to slow permeability in substratum.
Millgrove: Me, Mg	Poor: very poorly drained; generally wet in winter.	Moderate	Good	Poor: high content of fine material in sand and gravel.	Fair: clay loam and sandy clay loam material.	Fair to good: high content of fine material in sand and gravel.	Very poor drainage; seasonal high water table; moderate permeability.
Montgomery: Mm, Mn.	Poor: wet; clayey material.	High	Fair in Mm. Poor in Mn: clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Very poor drainage; seasonal high water table; very slow permeability; high volume change.
Morley: MoB, MrB, MrB2, MrC2, MrD2.	Poor: clayey material; generally wet in winter.	High	Fair: limited amount of suitable material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Moderately well drained soil; seasonal high water table for short periods; slow permeability; clayey material.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Silty material; poor stability in trenches; somewhat poor drainage; seasonal high water table.	Moderate to rapid rate of seepage, particularly in areas that have sandy layers; seasonal high water table.	Fair to poor compaction characteristics and stability; permeable when compacted; susceptible to piping.	Somewhat poor drainage; seasonal high water table; moderate permeability; flows when wet.	Moderate permeability; seasonal high water table; high available moisture capacity; somewhat poor drainage.	Nearly level; erodible and a source of siltation.	Nearly level; erodible and a source of siltation.
Very poor drainage; clayey material.	Very slow rate of seepage.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change.	Very poor drainage; very slow permeability; seasonal high water table.	Slow infiltration; very slow permeability; very poor drainage; seasonal high water table.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel; clayey material.
Somewhat poor drainage; clayey material.	Very slow rate of seepage; seasonal high water table.	Poor compaction characteristics and stability; very slowly permeable when compacted; clayey material; high compressibility.	Somewhat poor drainage; slow permeability; seasonal high water table.	Slow infiltration and permeability; somewhat poor drainage; seasonal high water table.	Nearly level; moderately erodible channel.	Nearly level; moderately erodbile channel; clayey material.
Very poor drainage; clayey substratum; seasonal high water table.	Very slow rate of seepage; seasonal high water table.	Fair compaction characteristics and stability; very slowly permeable when compacted; medium to high compressibility.	Very poor drainage; seasonal high water table; very slow permeability in substratum.	Moderate infiltration and permeability in uppermost 3 feet; very poor drainage; seasonal high water table; high available moisture capacity.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel.
Very poor drainage; trench walls are unstable; seasonal high water table.	Excessive seepage; seasonal high water table.	Good compaction characteristics and stability; substratum is permeable when compacted.	Very poor drainage; moderate permeability; seasonal high water table.	Moderate infiltration and permeability; seasonal high water table; high available moisture capacity.	Nearly level; seasonally wet.	Nearly level; seasonally wet.
Very poor drainage; seasonal high water table; clayey material.	Very slow rate of seepage; seasonal high water table.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change.	Very poor drainage; very slow permeability; seasonal high water table.	Slow infiltration; very slow permeability; seasonal high water table; high available moisture capacity.	Nearly level; clayey material.	Nearly level; clayey material; seasonally wet.
Clayey material; moderately well drained soil.	Slow rate of seepage; seasonal high water table for short periods.	Fair compaction characteristics and stability; very slowly permeable when compacted; moderate volume change.	Moderately well drained soil; slow permeability; seasonal high water table for short periods.	Slow permeability; medium available moisture capacity.	Gently sloping to moderately steep; moderately erodible channel.	Gently sloping to moderately steep; moderately erodible, clayey channel.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of— Topsoil	Sand and gravel	Road fill: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Nappanee: NaA, NpA, NpB, NtA, NtB, NtB2.	Poor: wet; clayey material.	High	Fair to poor: limited amount of suitable material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Somewhat poor drainage; seasonal high water table; very slow permeability; high content of clay.
Pewamo: Pm, Po	Poor: very poorly drained; clayey material.	High	Fair in Pm: moderately clayey material. Poor in Po: clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Very poor drainage; seasonal high water table; moderately slow permeability; clayey material.
Quarry: Qu. Features too variable for reliable evaluation.							
Rawson: RmB	Poor: generally wet and sticky in winter.	High	Fair: limited amount of suitable material.	Poor: high content of fine material.	Fair to poor: sandy clay loam to clay material.	Fair to poor: clay loam material.	Moderately well drained soil; slow to very slow permeability in substratum; seasonal high water table for short periods.
St. Clair: ScB, ScC2.	Poor: clayey material; generally wet in winter.	High	Fair to poor: limited amount of suitable material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Moderately well drained soil; seasonal high water table for short periods; very slow permeability; high clay content.
Shoals: Sh	Poor: somewhat poorly drained; wet in winter.	High	Good	Not suitable.	Poor: silty material.	Poor: silty material.	Subject to flooding; somewhat poor drainage; moderately slow permeability.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Clayey material; somewhat poor drainage; seasonal high water table.	Very slow rate of seepage; seasonal high water table.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change.	Somewhat poor drainage; very slow permeability; seasonal high water table.	Slow infiltration; very slow permeability; somewhat poor drainage; seasonal high water table; medium available moisture capacity.	Nearly level to gently sloping; moderately erodible channel.	Nearly level to gently sloping; moderately erodible channel.
Clayey material; very poor drainage; seasonal high water table.	Very slow rate of seepage; seasonal high water table.	Fair compaction characteristics and stability; slowly permeable when compacted; high volume change.	Very poor drainage; moderately slow permeability; seasonal high water table.	Moderately slow infiltration and permeability; very poor drainage; seasonal high water table; high available moisture capacity.	Nearly level; moderately erodible channel.	Nearly level; moderately erodible channel.
Clay loam substratum; moderately well drained soil.	Excessive seepage in uppermost 1½ to 3½ feet; seasonal high water table for short periods.	Good compaction characteristics and stability; substratum has high volume change on wetting and drying.	Moderately well drained soil; moderate permeability in uppermost 1½ to 3½ feet; slow to very slow permeability at a depth below 1½ to 3½ feet.	Moderate infiltration and permeability in uppermost 3½ feet; moderately well drained soil; medium available moisture capacity.	Gently sloping; moderate erodibility.	Gently sloping; moderate erodibility.
Clayey material; moderately well drained soil.	Very slow rate of seepage; seasonal high water table for short periods.	Poor compaction characteristics and stability; very slowly permeable when compacted; high clay content; subject to cracking.	Moderately well drained soil; very slow permeability; seasonal high water table for short periods.	Slow infiltration; very slow permeability; gently sloping to sloping.	Gently sloping to sloping; erodible, clayey channel.	Gently sloping to sloping; erodible, clayey channel.
Subject to flooding; silty material; seasonal high water table; trench walls subject to caving.	Moderate rate of seepage; permeable sandy layers in some areas.	Poor compaction characteristics and stability; slowly permeable when compacted; susceptible to piping.	Somewhat poor drainage; subject to flooding; moderately slow permeability.	Moderately slow permeability; somewhat poor drainage; subject to flooding; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as a source of— Topsoil	Sand and gravel	Road fill: Subsoil	Road fill: Substratum	Soil features affecting— Highway location
Sloan: So	Poor: very poorly drained; wet in winter.	High	Fair: silty clay loam material.	Not suitable.	Poor: silty material; poor compaction characteristics.	Poor: silty material; poor compaction characteristics.	Very poor drainage; seasonal high water table; subject to flooding; moderately slow permeability; silty material.
Toledo: To	Poor: very poorly drained; clayey material.	High	Poor: clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Very poor drainage; slow permeability; seasonal high water table.
Wabasha: Wa, Wh	Poor: very poorly drained; clayey material.	High	Fair in Wa: moderately clayey material. Poor in Wh: clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Subject to flooding; very poor drainage; seasonal high water table; slow permeability.
Wabasha, moderately shallow variant: Wb.	Poor: very poorly drained; clayey material.	High	Fair: moderately clayey material.	Not suitable.	Poor: clayey material.	Poor: clayey material.	Subject to flooding; very poor drainage; seasonal high water table; slow permeability; limestone at a depth of 20 to 40 inches.

interpretations—Continued

Soil features affecting—Continued						
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions	Waterways
	Reservoir area	Embankment				
Subject to flooding; seasonal high water table; silty material; trench walls subject to caving.	Subject to flooding; slow rate of seepage; susceptible to seepage locally in areas having sandy layers.	Poor compaction characteristics and stability; slowly permeable when compacted; susceptible to piping.	Very poor drainage; seasonal high water table; moderately slow permeability; subject to flooding; establishing outlets may be a problem.	Moderate infiltration; very poor drainage; seasonal high water table; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Seasonal high water table; very poor drainage; clayey material.	Very slow rate of seepage; seasonal high water table.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change.	Very poor drainage; slow permeability; seasonal high water table.	Slow infiltration; slow permeability; high available moisture capacity.	Nearly level	Nearly level; very poor drainage.
Subject to flooding; clayey material; seasonal high water table.	Subject to flooding; very slow rate of seepage.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change.	Very poor drainage; slow permeability; seasonal high water table; subject to flooding; establishing outlets may be a problem.	Slow infiltration and permeability; very poor drainage; seasonal high water table; high available moisture capacity.	Nearly level; subject to flooding.	Nearly level; subject to flooding.
Subject to flooding; clayey material; seasonal high water table; limestone at a depth of 20 to 40 inches.	Subject to flooding; very slow rate of seepage; limestone at a depth of 20 to 40 inches.	Poor compaction characteristics and stability; very slowly permeable when compacted; high volume change; limestone at a depth of 20 to 40 inches.	Very poor drainage; slow permeability; seasonal high water table; subject to flooding; establishing outlets may be a problem; limestone at depth of 20 to 40 inches.	Slow infiltration and permeability; very poor drainage; seasonal high water table; high available moisture capacity.	Nearly level; subject to flooding; limestone at a depth of 20 to 40 inches.	Nearly level; subject to flooding; limestone at a depth of 20 to 40 inches.

based on texture and pH value, but the ratings do not apply to concrete that has been mixed specifically to resist corrosion.

Engineering interpretations

Table 6 lists, for each soil in Van Wert County, interpretations of features that affect suitability for specific engineering purposes. These interpretations are based on the soil test data in table 4, on the estimates of properties in table 5, and on field experience. The column headings are discussed briefly in the following paragraphs.

The suitability for winter grading of many of the soils is not good during parts of the winter, because of wetness or plasticity. Such soils are rated as poor.

Susceptibility to frost action is greater in the silty and fine sandy soils that are wet most of the winter and that have a readily available source of water than in other soils. Such soils are among those rated high. Among other soils that are rated high are the wet, clayey Toledo and Hoytville soils (fig. 4).

***Figure 4.*—Surface of Hoytville soil. This soil is highly susceptible to frost action. Small mounds have formed as the result of alternate freezing and thawing.**

Suitability as a source of topsoil depends upon thickness, texture, and inherent fertility of the surface layer. Topsoil is used as topdressing to promote the growth of vegetation on roadbanks and embankments. Very sandy or clayey soils are poorly suited.

A rating of good as a source of sand and gravel for construction purposes does not mean that all areas of the soil have possibilities for commercial development of sand and gravel. It indicates only that the possibilities are better than for soils rated fair or poor. Local areas, generally not extensive, along the stream terraces are most likely to contain clean sand and gravel.

Among the soil features that affect highway location are depth to bedrock, depth to the water table, slope, soil slippage, and hazard of flooding. Susceptibility to frost action and shrink-swell potential also affect highway location.

Among the soil features that affect the construction and maintenance of pipelines are depth to hard bedrock, soil stability, and natural drainage, as well as corrosion potential.

For farm ponds, the soil features that affect the reservoir area are mainly those that affect the sealing potential of the reservoir, but depth to bedrock and, on flood plains, hazard of flooding are also considered. The soil features that affect embankments are stability and permeability of the soil material. Permeability is given for soil material when compacted at optimum moisture content. The information in this column also applies to dikes and levees.

The soil features that affect agricultural drainage are natural drainage, permeability, and a high seasonal water table.

Among the features that affect irrigation are the relative ease with which water infiltrates and percolates through the soil, water-holding capacity, and drainage.

The main features that affect terraces and diversions are slope and erodibility. Others considered are depth to rock and a seasonal high water table. Terraces are not needed on nearly level soils, and they are not well suited to steep soils. Special care is needed in the construction of diversions on highly erodible soils.

The main features that affect waterways are slope and erodibility. Wetness and seepage are also noted, if applicable.

Soil materials and their relationship to engineering uses

The most extensive engineering soil materials in the county are clay loam or clay glacial till and lacustrine clay and silt. The till underlies most of the county. The lacustrine sediments are on the lake plain in the northeastern part of the county, and they are underlain by glacial till. Limestone is near the surface in several places.

The depth to slightly weathered glacial till ranges from about 2 feet in St. Clair and Nappanee soils to as much as 5 feet in Hoytville and Pewamo soils. Clay loam glacial till occurs in the western part of York Township, in the southern and central parts of Liberty Township, and in parts of Willshire Township. This till commonly has pockets of silt, which are more prevalent where the till underlies Blount soils than where the till underlies other soils. These pockets are variable in size and tend to have less stability than the surrounding till.

In places the Latty, Montgomery, and McGary soils have lacustrine deposits of clay and silt more than 2 or 3 feet thick. These soil materials are generally less stable than the till materials.

In most places where it is near the surface, the limestone has been quarried commercially. Limestone is likely to be within 4 or 5 feet of the surface in areas adjacent to quarries and to the moderately shallow variants of Hoytville and Wabasha soils.

Soils and Land Use Planning

Most of the acreage in Van Wert County is used for farms, but on the outer limits of such towns as Van Wert and Delphos, there are nonfarm areas where the expansion of population has resulted in expanding use of land for houses, roads, and public utilities. This expansion into nonfarm uses can, in a short period, remove many acres from farm use. Highways, airports, factories, houses, and

shopping centers tend to remove land permanently from farm use. In general, areas that are desirable for community development and industrial use are those that are less costly to develop than other areas, and many of these areas also have good potential for farms.

Table 7 shows estimates of the degree and kind of limitation for each of the soils in Van Wert County for farming and other specified uses. These estimates can be used as a basis for long-range planning and zoning. The ratings given do not apply in areas where extensive manipulation of the soil has altered some of its natural properties, as they do in areas where there has been extensive cutting and filling. Erosion in such areas is a serious hazard because the natural vegetation has been removed or destroyed. Conservation practices are needed as much in these areas as they are in many areas that are farmed.

The degree of limitation for a specified use depends on soil properties. The estimated degree of limitation for each soil in table 7 is given as *slight*, *moderate*, or *severe*. Slight indicates that the limitation is not important; moderate indicates that there are some limitations that can be overcome or corrected; severe indicates that there are serious problems that are generally costly and difficult to overcome.

The column headings in table 7 are discussed in the following paragraphs.

FARMING (CULTIVATED CROPS).—The degree of limitation for farming is based on slope, erosion hazard, seasonal wetness, and other features that affect the use of soils for cultivated crops.

DISPOSAL OF SEWAGE EFFLUENT FROM SEPTIC TANKS.—The degree of limitation for the disposal of sewage effluent from septic tanks is based on soil properties that are important to the proper installation of filter fields and to their capacity to absorb the effluent. Among these properties are permeability, depth to bedrock, slope, natural drainage, depth to the water table, and hazard of flooding. In soils that have a gravelly and sandy substratum, the effluent is inadequately filtered and can contaminate ground water and nearby springs, lakes, and streams.

SEWAGE LAGOONS.—These shallow ponds, which are built to dispose of sewage through the process of oxidation, may be needed in areas where septic tanks and central sewage systems are not feasible or not practical. Among the soil features that determine the degree of limitation are hazard of flooding, slope, and permeability.

BUILDING SITES.—The degree of limitation for building sites applies to residential, commercial, institutional, and light industrial buildings that have basements and are not more than three stories high. Among the soil features considered were slope, natural drainage, and flooding. The method of sewage disposal was not considered.

Flooding, even if infrequent, is a severe limitation for permanently used structures because it causes costly damage. Basements in naturally wet soils are likely to be wet, unless adequate drainage is provided. Among the wet soils in this county are Pewamo, Toledo, Hoytville, and Latty soils. By means of well-developed systems of tile drains and open ditches, many areas of wet soils have been made suitable for farming. Excavations for buildings are apt to disrupt these drainage systems. The coarser textured soils, such as Belmore and Haney soils, are more favorable for supporting structural foundations than soft compressible soils, such as McGary and Kibbie soils. In soils that have a high shrink-swell potential, unless special precautions are taken, the heaving and cracking of foundations is likely. The alinement of sidewalks, patios, floors, basement walls, and rock walls is also affected. If depth to bedrock is limited, excavating basements and installing underground utility lines are difficult and expensive. The control of erosion is a problem if excavating and leveling take place in sloping areas.

LAWNS, LANDSCAPE PLANTINGS, AND GOLF FAIRWAYS.—The degree of limitation for lawns and golf fairways is based on natural drainage, slope, texture of the surface layer, hazard of flooding, and other soil features. The uppermost foot of the natural surface layer can be pushed aside during the process of construction and then replaced after construction and grading are finished. This soil material provides a good rooting zone for lawn grasses, flowers, shrubs, and trees. The natural surface layer removed in grading for streets can also be used to improve other areas, where needed.

STREETS AND PARKING LOTS.—The degree of limitation for streets and parking lots is based on drainage, slope, hazard of flooding, and other soil features. Susceptibility to frost action should also be considered. The limitation applies to streets and parking lots in subdivisions, but it does not apply in areas that are subject to continuous heavy traffic. The degree of limitation is severe where the slope is more than 6 percent.

ATHLETIC FIELDS AND OTHER INTENSIVE PLAY AREAS.—The degree of limitation for athletic fields and other intensive play areas is based on slope, surface texture, permeability, natural drainage, hazard of flooding, and other soil features. These areas are used as fields for playing baseball, football, tennis, volleyball, badminton, and other sports. Areas where the slope is more than 2 percent may need considerable reshaping because they must be nearly level for this kind of use. Consequently, the degree of limitation is moderate to severe as the slope increases. Soils on flood plains can be used for such facilities as ball diamonds and tennis courts, which are not used during normal periods of flooding. Flooding causes some damage to these kinds of play areas, and the local flooding hazard should be carefully evaluated during the planning stage.

PARKS AND OTHER EXTENSIVE PLAY AREAS.—The degree of limitation for parks and other extensive play areas is based on slope, texture of the surface layer, natural drainage, and hazard of flooding. These areas provide a variety of wildlife and natural vegetation and are used for picnicking, hiking, nature study, and other recreational purposes. The generally long, winding areas along streams and in the adjacent scenic hills are excellent for these purposes. Practices that help to control erosion should be used in the construction and maintenance of paths in all of the picnic and play areas.

CAMPSITES.—Sites for tents and trailers should be in areas that have an attractive landscape, good trafficability, and medium or high productivity of grasses and trees. There are fewer serious limitations for soils that have good or moderately good natural drainage than for soils that are wet. A clayey surface texture is undesirable.

SANITARY LAND FILLS (TRENCH TYPE).—Soils that are deep, well drained or moderately well drained, and slowly permeable are better suited to sanitary land fills than are other soils. Most of the slowly permeable soils, however, are difficult to work when wet and have poor trafficability

TABLE 7.—*Degree and kind of limitation*

Soil series and map symbols	Farming (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites for homes of three stories or less	Lawns, landscape plantings, and golf fairways
Belmore:					
BmA	Slight	Slight: hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable material; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight	Slight
BlB, BmB	Slight	Slight: hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable material; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight	Slight
BmC	Moderate: slope; erosion.	Moderate: slope; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable material; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: slope	Moderate: slope
Blount:					
BnA, BoA	Slight	Severe: slow permeability.	Slight	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
BnB, BoB, BoB2	Slight in BnB and BoB. Moderate in BoB2; slope; erosion.	Severe: slow permeability.	Moderate: slope	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
Clay pits: Cp. Properties too variable for reliable evaluation.					
Colwood: Cw	Slight	Severe: very poor drainage.	Moderate: moderately permeable material.	Severe: very poor drainage; soft and compressible.	Severe: very poor drainage.
Cut and fill land: Cx. Properties too variable for reliable evaluation.					
Defiance: De, Df	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

for specified uses

Streets and parking lots	Athletic fields and other intensive play areas	Parks and other extensive play areas	Campsites		Sanitary land fill (trench type)	Cemeteries
			For tents	For trailers		
Slight	Slight	Slight	Slight	Slight	Severe: moderately rapid permeability; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight.
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe: moderately rapid permeability; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight.
Severe: slope	Severe: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: moderately rapid permeability; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: slope.
Moderate: somewhat poor drainage.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Moderate: clay loam texture; somewhat poor drainage.	Severe: slow permeability.
Moderate: somewhat poor drainage; slope.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Moderate: clay loam texture; somewhat poor drainage.	Severe: slow permeability.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.
Severe: subject to flooding.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

TABLE 7.—*Degree and kind of limitation*

Soil series and map symbols	Farming (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites for homes of three stories or less	Lawns, landscape plantings, and golf fairways
Digby:					
DgA, DmA	Slight	Moderate: somewhat poor drainage; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable material; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
DgB, DmB	Slight	Moderate: some what poor drainage; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable material; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
Eel: Em	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Elliott: EoB	Slight	Severe: slow permeability.	Moderate: slope	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
Haney:					
HdA	Slight	Slight: hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate to severe: moderately permeable material within uppermost 5 feet; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight	Slight
HaB, HdB	Slight	Slight: hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate to severe: moderately permeable material within uppermost 5 feet; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Slight	Slight
Haskins:					
HkA HnA	Slight	Severe: slow permeability.	Moderate: moderate permeability in uppermost 20 to 40 inches.	Moderate: seasonal high water table.	Moderate: seasonal high water table.

for specified uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Parks and other extensive play areas	Campsites		Sanitary land fill (trench type)	Cemeteries
			For tents	For trailers		
Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Severe: somewhat poor drainage; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: somewhat poor drainage.
Moderate: somewhat poor drainage; slope.	Moderate: somewhat poor drainage; slope.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage; slope.	Severe: permeable substratum; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: somewhat poor drainage.
Slight: subject to flooding.	Slight to severe, depending on severity of local flooding.	Slight to severe, depending on severity of local flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Moderate: somewhat poor drainage; slope.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Moderate: somewhat poor drainage; clay loam or silty clay loam texture.	Severe: somewhat poor drainage.
Slight	Slight	Slight	Slight	Slight	Severe: moderately well drained; permeable material within uppermost 5 feet; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: moderately well drained.
Moderate: slope.	Moderate: slope.	Slight	Slight	Moderate: slope.	Severe: moderately well drained; permeable material within uppermost 5 feet; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Moderate: moderately well drained.
Moderate: seasonal high water table.	Moderate to severe: slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonal high water table; slow permeability at a depth below 20 to 40 inches.	Severe: seasonal high water table; slow permeability at a depth below 20 to 40 inches.	Severe: seasonal high water table; slow permeability at a depth below 20 to 40 inches.

TABLE 7.—*Degree and kind of limitation*

Soil series and map symbols	Farming (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites for homes of three stories or less	Lawns, landscape plantings, and golf fairways
Haskins—Continued HkB, HnB	Slight	Severe: slow permeability.	Moderate: moderately permeable material in uppermost 20 to 40 inches; slope.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Hoytville: Ho, Hv	Slight	Severe: very poor drainage; moderately slow permeability.	Slight	Severe: very poor drainage.	Severe: very poor drainage.
Hoytville, moderately shallow variant: Hs.	Moderate: moderately deep to limestone.	Severe: moderately deep to limestone; very poor drainage.	Moderate: moderately deep to limestone.	Severe: very poor drainage.	Severe: very poor drainage.
Kibbie: Ks	Slight	Moderate: somewhat poor drainage; moderate permeability.	Moderate: moderately permeable material.	Moderate: somewhat poor drainage; soft and compressible when wet.	Moderate: somewhat poor drainage.
Latty: La, Lc	Moderate: wetness.	Severe: very poor drainage; slow permeability.	Slight	Severe: very poor drainage.	Severe: very poor drainage.
McGary: Mc	Moderate: wetness.	Severe: slow permeability.	Slight	Moderate: somewhat poor drainage; soft and compressible when wet.	Moderate: somewhat poor drainage.
Mermill: Md	Slight	Severe: very poor drainage; very slow permeability in substratum.	Slight	Severe: very poor drainage.	Severe: very poor drainage.
Millgrove: Me, Mg	Slight	Severe: very poor drainage; permeable substratum; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: permeable substratum; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: very poor drainage.	Severe: very poor drainage.
Montgomery: Mm, Mn	Moderate: wetness.	Severe: very poor drainage; slow permeability.	Slight	Severe: very poor drainage; soft and compressible when wet.	Severe: very poor drainage; clayey surface layer in Mn.
Morley: MoB, MrB, MrB2	Slight for MoB, MrB. Moderate for MrB2: erosion.	Severe: slow permeability.	Moderate: slope	Slight	Slight
MrC2	Moderate: slope; erosion.	Severe: slow permeability.	Severe: slope	Moderate: slope	Moderate: slope

for specified uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Parks and other extensive play areas	Campsites		Sanitary land fill (trench type)	Cemeteries
			For tents	For trailers		
Moderate: slope; seasonal high water table.	Moderate to severe: slope; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability at a depth below 20 to 40 inches.	Moderate: seasonal high water table; slow permeability at a depth below 20 to 40 inches; slope.	Severe: seasonal high water table; slow permeability at a depth below 20 to 40 inches.	Severe: seasonal high water table; slow permeability at a depth below 20 to 40 inches.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: moderately deep to limestone; very poor drainage.	Severe: very poor drainage; moderately deep to limestone.
Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage; moderate permeability.	Severe: somewhat poor drainage.
Severe: very poor drainage.	Severe: very poor drainage; slow permeability.	Severe: very poor drainage.	Severe: very poor drainage; slow permeability.	Severe: very poor drainage; slow permeability.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture.
Moderate: somewhat poor drainage.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Severe: subject to ponding; clayey texture.	Severe: somewhat poor drainage; slow permeability; clayey texture.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage; permeable substratum; hazard of polluting the water supply in areas where the substratum is porous and filtration is inadequate.	Severe: very poor drainage,
Severe: very poor drainage.	Severe: very poor drainage; slow permeability; clayey surface layer in Mn.	Severe: very poor drainage; clayey surface layer in Mn.	Severe: very poor drainage; clayey surface layer in Mn.	Severe: very poor drainage; clayey surface layer in Mn.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture.
Moderate: slope.	Severe: slow permeability.	Slight	Severe: slow permeability.	Severe: slow permeability.	Slight	Severe to moderate: slow permeability.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope.	Severe: slow permeability.	Severe: slope; slow permeability.	Moderate: slope	Moderate: slope.

TABLE 7.—*Degree and kind of limitation*

Soil series and map symbols	Farming (cultivated crops)	Disposal of sewage effluent from septic tanks	Sewage lagoons	Building sites for homes of three stories or less	Lawns, landscape plantings, and golf fairways
Morley—Continued					
MrD2	Severe: slope; erosion.	Severe: slow permeability.	Severe: slope	Severe: slope	Severe: slope
Nappanee:					
NaA, NpA, NtA	Moderate: wetness.	Severe: slow permeability.	Slight	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
NpB, NtB, NtB2	Moderate: wetness.	Severe: slow permeability.	Moderate: slope	Moderate: somewhat poor drainage.	Moderate: somewhat poor drainage.
Pewamo: Pm, Po	Slight	Severe: moderately slow permeability; very poor drainage.	Slight	Severe: very poor drainage.	Severe: very poor drainage.
Quarry: Qu. Properties too variable for reliable evaluation.					
Rawson: RmB	Slight	Severe: slow to very slow permeability.	Severe: moderate permeability in uppermost 20 to 40 inches.	Slight	Slight
St. Clair:					
ScB	Moderate: slope; erosion.	Severe: very slow to slow permeability.	Moderate: slope	Slight	Moderate: droughty.
ScC2	Severe: slope; erosion.	Severe: very slow to slow permeability.	Severe: slope	Moderate: slope	Moderate: droughty; slope.
Shoals: Sh	Slight	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Sloan: So	Moderate: wetness.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Toledo: To	Moderate: wetness.	Severe: very poor drainage; slow permeability.	Slight	Severe: very poor drainage; soft and compressible when wet.	Severe: very poor drainage.
Wabasha: Wa, Wb, Wh	Moderate: wetness.	Severe: subject to flooding; very poor drainage; slow permeability.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; clayey surface layer in Wh.

for specified uses—Continued

Streets and parking lots	Athletic fields and other intensive play areas	Parks and other extensive play areas	Campsites: For tents	Campsites: For trailers	Sanitary land fill (trench type)	Cemeteries
Severe: slope.	Severe: slope; slow permeability.	Severe: slope.	Severe: slope; slow permeability.	Severe: slope; slow permeability.	Severe: slope.	Severe: slope.
Moderate: somewhat poor drainage.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: somewhat poor drainage; slow permeability; clayey texture.
Moderate: somewhat poor drainage.	Severe: slow permeability.	Moderate: somewhat poor drainage.	Severe: slow permeability.	Severe: slow permeability.	Severe: clayey texture.	Severe: somewhat poor drainage; slow permeability; clayey texture.
Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.	Severe: very poor drainage.
Moderate: slope.	Moderate: slope.	Slight.	Slight.	Moderate: slope.	Severe: moderate permeability in uppermost 20 to 40 inches.	Severe: moderately well drained; slow permeability in substratum.
Moderate: slope.	Severe: very slow to slow permeability.	Slight.	Severe: very slow to slow permeability.	Severe: very slow to slow permeability.	Severe: clayey texture.	Severe: very slow to slow permeability; clayey texture.
Severe: slope.	Severe: slope; very slow to slow permeability.	Moderate: slope.	Severe: slope; very slow to slow permeability.	Severe: slope; very slow to slow permeability.	Severe: clayey texture.	Severe: very slow to slow permeability; clayey texture.
Severe: subject to flooding.	Moderate to severe: somewhat poor drainage; subject to flooding.	Moderate to severe: somewhat poor drainage; subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: subject to flooding.	Severe: very poor drainage; subject to flooding.	Severe: very poor drainage.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: very poor drainage.	Severe: very poor drainage; slow permeability; clayey texture.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture.	Severe: very poor drainage; clayey texture; subject to ponding.	Severe: very poor drainage; slow permeability; clayey texture.
Severe: subject to flooding.	Severe: very poor drainage; clayey surface layer in Wh.	Severe: very poor drainage.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.

because they are clayey and seasonally saturated. In places water accumulates in the trenches that are being filled with refuse. The use of permeable soils for sanitary land fills can result in the pollution of ground water and springs and streams. Flooding is a serious limitation because of the risk of pollution. On most of the soils, the use of properly designed access roads and drainage systems can help to minimize the effect of excessive wetness.

Cemeteries.—The limitations for cemeteries are least in areas where the soils are deep, are well drained or moderately well drained, and have slopes of less than 12 percent. The texture of the surface layer, seasonal high water table, hazard of flooding, and permeability are also considered.

Utility Lines.—Although not mentioned in table 7, the installation and maintenance of utility lines are affected by soil properties. Among these properties are depth to bedrock, natural drainage, height of the water table, and corrosion potential. Trench walls are unstable in some soils. Other related soil properties are those that affect the establishment, control, and maintenance of vegetation along rights-of-way.

Descriptions of the Soils

In this section the soils of Van Wert County are described in detail. First the soil series is described, and then the mapping units in that series are described. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

Each series description contains a short narrative description of a soil profile considered representative of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. The colors described are for moist soils, unless otherwise noted. Soil materials that have a Munsell color value of 4 or more are considered light colored; those that have a color value of less than 4 are considered dark colored. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and others are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 8. The "Guide to Mapping Units" lists the mapping units of the county and shows the capability unit each mapping unit is in and the page where each of these is described.

Belmore Series

The Belmore series consists of nearly level to sloping, well-drained soils that formed in thick deposits of glacial outwash. These soils are mainly on beach ridges and stream

Table 8.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Belmore sandy loam, 2 to 6 percent slopes	99	[1]
Belmore loam, 0 to 2 percent slopes	137	0. 1
Belmore loam, 2 to 6 percent slopes	865	. 3
Belmore loam, 6 to 12 percent slopes	65	[1]
Blount loam, 0 to 2 percent slopes	432	. 2
Blount loam, 2 to 6 percent slopes	610	. 2
Blount silt loam, 0 to 2 percent slopes	39, 428	15. 1
Blount silt loam, 2 to 6 percent slopes	17, 142	6. 5
Blount silt loam, 2 to 6 percent slopes, moderately eroded	157	. 1
Clay pits	22	[1]
Colwood silt loam	189	. 1
Cut and fill land	96	[1]
Defiance silt loam	119	[1]
Defiance silty clay loam	111	[1]
Digby sandy loam, 0 to 2 percent slopes	99	[1]
Digby sandy loam, 2 to 6 percent slopes	98	[1]
Digby loam, 0 to 2 percent slopes	1, 042	. 4
Digby loam, 2 to 6 percent slopes	688	. 3
Eel silt loam	76	[1]
Elliott silt loam, 0 to 4 percent slopes	436	. 2
Haney sandy loam, 2 to 6 percent slopes	106	[1]
Haney loam, 0 to 2 percent slopes	129	[1]
Haney loam, 2 to 6 percent slopes	835	. 3
Haskins fine sandy loam, 0 to 2 percent slopes	90	[1]
Haskins fine sandy loam, 2 to 6 percent slopes	206	. 1
Haskins loam, 0 to 2 percent slopes	1, 483	. 6
Haskins loam, 2 to 6 percent slopes	885	. 3
Hoytville clay	61, 131	23. 4
Hoytville silty clay loam	15, 093	5. 8
Hoytville silty clay loam, moderately shallow variant	107	[1]
Kibbie silt loam	96	[1]
Latty clay	10, 595	4. 0
Latty silty clay loam	324	. 1
McGary silt loam	84	[1]
Mermill silt loam	248	. 1
Millgrove silt loam	365	. 1
Millgrove silty clay loam	250	. 1
Montgomery silty clay	4, 657	1. 8
Montgomery silty clay loam	1, 415	. 5
Morley loam, 2 to 6 percent slopes	378	. 1
Morley silt loam, 2 to 6 percent slopes	3, 285	1. 3
Morley silt loam, 2 to 6 percent slopes, moderately eroded	1, 266	. 5
Morley silt loam, 6 to 12 percent slopes, moderately eroded	560	. 2
Morley silt loam, 12 to 18 percent slopes, moderately eroded	63	[1]
Nappanee loam, 0 to 2 percent slopes	129	[1]
Nappanee silt loam, 0 to 2 percent slopes	3, 678	1. 4
Nappanee silt loam, 2 to 6 percent slopes	625	. 2
Nappanee silty clay loam, 0 to 2 percent slopes	4, 052	1. 5
Nappanee silty clay loam, 2 to 6 percent slopes	315	. 1
Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	178	. 1
Pewamo silty clay loam	76, 031	29. 7
Pewamo silty clay	1, 034	. 4
Quarry	250	. 1
Rawson loam, 2 to 6 percent slopes	230	. 1
St. Clair silt loam, 2 to 6 percent slopes	218	. 1
St. Clair silt loam, 6 to 12 percent slopes, moderately eroded	203	. 1
Shoals silt loam	195	. 1
Sloan silty clay loam	1, 390	. 5
Toledo silty clay	1, 841	. 7
Wabasha silty clay loam	4, 301	1. 6
Wabasha silty clay	1, 103	. 4
Wabasha silty clay loam, moderately shallow variant	125	[1]
Water	300	. 1
Total	261, 760	100. 0

[1] Less than 0.05 percent.

terraces. They are the only well-drained soils in the county.

In a representative profile the surface layer is very dark grayish-brown to dark-brown loam about 9 inches thick. The next layer, to a depth of 29 inches, is dark yellowish-brown to dark-brown loam that contains a few fine pebbles. Below this are dark-brown and dark reddish-brown layers of gravelly clay loam, gravelly sandy clay loam, and sandy clay loam to a depth of 60 inches. In these layers reaction ranges from strongly acid at a depth of 29 inches to moderately alkaline at a depth of 60 inches. There is loose gravelly sandy loam at a depth between 60 and 70 inches.

Permeability is moderately rapid, and the available moisture capacity is medium. The rooting zone is deep and is strongly acid to neutral in reaction. The soils are droughty late in summer, even in years when rainfall is normal.

Soils of the Belmore series are used for general farm crops and truck crops. They have fewer limitations for building sites and as road locations than other soils in the county, and they are used for these purposes.

Representative profile of Belmore loam in the SE¼ sec. 11, T. 2 S., R. 3 E. (Ridge Township).

Ap1—0 to 4 inches, very dark grayish-brown (10YR 3/2) loam; weak and moderate, fine and medium, granular structure; very friable; many roots; slightly acid; wavy boundary.

Ap2—4 to 9 inches, dark-brown (10YR 3/3) loam; weak, fine and medium, granular structure; friable; many roots; neutral; clear, wavy boundary.

B1—9 to 13 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine and medium, subangular blocky structure; friable; common roots; few fine pebbles; slightly acid; clear, smooth boundary.

B21t—13 to 21 inches, dark-brown (7.5YR 4/4) loam; moderate, medium and coarse, subangular blocky structure; firm; thin patchy clay films on ped surfaces; common roots; few fine pebbles; slightly acid; gradual, smooth boundary.

B22t—21 to 29 inches, dark-brown (7.5YR 4/3) loam; moderate, coarse and very coarse, subangular blocky structure; firm; thin patchy clay films on ped surfaces; few fine pebbles; medium acid; clear, wavy boundary.

B23t—29 to 36 inches, dark-brown (7.5YR 4/3) gravelly clay loam; weak, medium, subangular blocky structure; firm; thin, continuous clay films on ped surfaces: strongly acid; clear, wavy boundary.

B24t—36 to 49 inches, dark reddish-brown (5YR 3/3) gravelly sandy clay loam; weak, medium, subangular blocky structure; friable; thin continuous clay films on ped surfaces; medium acid; diffuse, irregular boundary.

B3t—49 to 60 inches, dark-brown (7.5YR 3/2) sandy clay loam; fine, distinct, olive-colored (5Y 5/3) mottles; massive; firm; few fine pebbles; neutral; abrupt, irregular boundary.

C—60 to 70 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; single grain; loose; moderately alkaline (calcareous).

The Ap horizon is loam in most places, but it is sandy loam or fine sandy loam in some places. It ranges from 10YR 3/2 to 10YR 4/2 in color and from 8 to 10 inches in thickness. In areas that have not been cultivated, the A1 horizon is 10YR 3/2 in color and 4 to 6 inches in thickness. The texture in the upper part of the B horizon is loam, sandy loam, or light clay loam. The texture in the lower part of the B horizon is commonly clay loam or sandy clay loam; it is not more clayey than heavy clay loam. In some places the lower part of the B horizon is gravelly. The A3 and B3 horizons are lacking in places. Generally, there is no evidence of mottling in the uppermost 40 inches. Reaction in the solum is medium acid or slightly acid in most places, but it ranges from strongly acid to neutral. The lowest pH value generally occurs in the B2t horizon, at a depth between 20 and 36 inches. The depth to calcareous material is 50 inches in most places, but the depth ranges from about 40 to 60 inches. In most places, all the horizons contain fine gravel in varying amounts, but in areas of local outwash there is commonly no fine gravel above the C horizon. The C horizon is sandy and gravelly and has varying amounts of silty and clayey material.

In this county the Belmore soils have a darker colored Ap horizon than the defined range for the series, but this difference does not alter their usefulness and behavior.

Belmore soils are the well-drained soils in a drainage sequence with the moderately well drained Haney soils, the somewhat poorly drained Digby soils, and the very poorly drained Millgrove soils. Belmore soils are commonly adjacent to one or more of these other soils, but they lack the mottling that the other soils have in varying degree.

Belmore sandy loam, 2 to 6 percent slopes (BlB).—This soil occurs ordinarily as small areas. It is mainly in areas of local outwash on moraines, but it is also on the crest of beach ridges and on some of the stream terraces. It has a profile similar to the one described as representative of the series, except that the surface layer is coarser textured. This soil is more droughty than other Belmore soils.

Included in mapping were areas of fine sandy loam, commonly on elevated flats on wide beach ridges, but less commonly on elevated flats on stream terraces. Also included were a few areas, on the higher beach ridges, where the surface layer is gravelly.

Surface runoff is medium, and a moderate erosion hazard is the main limitation for crops. Slope is a limitation for some nonfarm uses. (Capability unit IIe-1)

Belmore loam, 0 to 2 percent slopes (BmA).—This soil is on the wide beach ridges and on high stream terraces and outwash plains. It is the least droughty of the Belmore soils.

Included in mapping were areas where the surface layer is silt loam. These areas are in the southwestern part of the county on slightly elevated, tablelike flats near the crest of the Fort Wayne terminal moraine.

Seasonal droughtiness is the main limitation for farming. There are few limitations for most nonfarm uses. Surface runoff is slow, and there is little or no erosion hazard. (Capability unit IIs-1)

Belmore loam, 2 to 6 percent slopes (BmB).—This soil occurs mainly as long, rather narrow areas on beach ridges, but it also occurs as fairly broad, elongated areas on stream terraces adjacent to the St. Marys River. It occurs less commonly on small terraces along the smaller streams. It has the profile described as representative of the series.

Included in mapping were mainly small areas where the surface layer is silt loam. These inclusions are generally rather small, oval-shaped areas on high terraces, but they also occur as small scattered areas at some of the higher elevations on the Fort Wayne terminal moraine. Also included were small areas, on the crests of beach ridges, where the surface layer is gravelly loam.

Surface runoff is medium, and erosion is a moderate hazard in cultivated areas. Slope is a limitation for some nonfarm uses. (Capability unit IIe-1)

Belmore loam, 6 to 12 percent slopes (BmC).—This soil occurs in distinct patterns, mainly on the flanks of stream terraces where the slopes are generally short. It is rarely cultivated.

Included in mapping were a few areas where the surface layer is sandy loam or gravelly loam, as well as a few moderately eroded areas.

Surface runoff is medium to rapid, and unless the soil is protected, erosion is a severe hazard where crops are grown. Slope is the dominant limitation for many nonfarm uses. (Capability unit IIIe-1)

Blount Series

The Blount series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in compact, calcareous glacial till. These soils are on uplands throughout the county, south of U.S. Route 30.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick, and below this is light brownish-gray silt loam about 2 inches thick. The next layer is grayish-brown clay loam to a depth of 16 inches. Below this is dark grayish-brown clay. At a depth below 28 inches is dark-brown, compact clay loam glacial till.

Permeability is slow. The compact glacial till inhibits the movement of water and the growth of roots. The water table is high in winter and spring. The root zone is only moderately deep and is seasonally saturated with free water. Reaction is very strongly acid in the upper part of the root zone, but it becomes less acid with increasing depth.

Soils of the Blount series are used principally for grain, pasture, and woodland, in that order. Many acres have been artificially drained for crop production. If artificially drained, these soils warm up and dry out more quickly in spring.

Representative profile of Blount silt loam in the SW¼ sec. 2, T. 2 S., R. 1 E. (Harrison Township).

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many roots; neutral; clear, smooth boundary.

A2—9 to 11 inches, light brownish-gray (10YR 6/2) silt loam; few, fine, faint mottles of brownish yellow (10YR 6/6); weak, fine, granular structure; friable; many roots; strongly acid; clear, irregular boundary.

B1t—11 to 16 inches, grayish-brown (10YR 5/2) clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6 or 5/8); moderate, medium, subangular blocky structure; firm; thin, patchy clay films on ped surfaces; dark grayish-brown (10YR 4/2) and grayish-brown (10YR 5/2) coatings on peds; few small pebbles of igneous rock; common roots; very strongly acid; diffuse, gradual boundary.

B2t—16 to 28 inches, dark grayish-brown (10YR 4/2) clay; common, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; very firm; few small pebbles of igneous rock and weathered fragments of shale; thin, continuous clay films; grayish-brown (10YR 5/2) and dark grayish-brown (10YR 4/2) coatings on peds; slightly acid; clear, wavy boundary.

C—28 to 60 inches, dark-brown (10YR 4/3) clay loam; common, medium, distinct mottles of olive gray (5Y 5/2) and light olive gray (5Y 6/2); massive; very firm; few small pebbles of igneous rock and weathered fragments of limestone and shale; moderately alkaline (calcareous).

The A horizon is silt loam or loam. The color of the A horizon is 10YR 4/2 and 5/2 in most places, but it ranges from 10YR 4/2 to 10YR 6/2. The B horizon is very strongly acid or strongly acid in the upper layers, but it is progressively less acid with increasing depth. The depth to carbonates is commonly about 30 inches, but it ranges from 20 to 42 inches.

Blount soils are the somewhat poorly drained soils in a drainage sequence with the moderately well drained Morley soils and the very poorly drained Pewamo soils. Blount soils have a clayey B horizon at greater depth than that of the somewhat poorly drained Nappanee soils, and they have a B1 horizon. The B1 horizon is either lacking or very thin in the Nappanee soils.

Blount loam, 0 to 2 percent slopes (BnA).—This soil occurs mainly as small areas that are well scattered across the till plains. Most of these areas are 5 to 10 acres in size, but a few are 10 to 15 acres. Areas of this soil generally occur in slightly higher positions than areas of Blount silt loam. This soil has a profile similar to the one described as representative of the series, but the plow layer contains more sand and is as much as 14 inches thick in places. The plow layer is about 12 inches thick in most places. This soil is easier to till than the representative Blount soil because the plow layer contains more sand.

Included in mapping were a few areas of the very poorly drained Pewamo soils in depressions and along drainageways.

A seasonal high water table is the main limitation for farming. Surface runoff is slow. Seasonal wetness and slow permeability are limitations for many nonfarm uses. (Capability unit IIw-4)

Blount loam, 2 to 6 percent slopes (BnB).—This soil occurs mainly as numerous, small, slightly elevated, oval areas on the till plains and the moraine, but it also occurs as narrow, elongated areas adjacent to beach ridges and stream terraces. Most oval areas are 5 to 10 acres in size. Areas of this soil are commonly adjacent to areas of Blount silt loam. This soil has a profile similar to the one described as representative of the series, but the plow layer contains more sand and is as much as 14 inches thick in some places. The plow layer is 10 to 12 inches thick in most places. This soil is easier to cultivate than Blount silt loam, 0 to 2 percent slopes, because the plow layer contains more sand.

A seasonal high water table is the main limitation for farming. Surface runoff is medium to rapid, and erosion is a hazard in cultivated areas. Slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIw-4)

Blount silt loam, 0 to 2 percent slopes (BoA).—This soil occurs as small areas in some places and as large areas in others. Areas of this soil are commonly adjacent to areas of Pewamo soils, and small plowed areas commonly appear as light-colored islands surrounded by the dark-colored Pewamo soils. This soil has the profile described as representative of the series. It is more susceptible to surface crusting than is Blount loam.

Included in mapping, commonly within the larger areas of this soil, were Pewamo soils in depressions and along drainageways.

A seasonal high water table is the main limitation for farming. Surface runoff is slow to ponded. The content of organic matter is low. Seasonal wetness and slow permeability are limitations for many nonfarm uses. (Capability unit IIw-4)

Blount silt loam, 2 to 6 percent slopes (BoB).—This soil is mainly on the Fort Wayne moraine and on breaks adjacent to stream valleys. Areas of this soil are commonly adjacent to areas of Morley soils and, to a lesser extent, to areas of Pewamo soils. This soil is similar to the one described as representative of the series, except for the slope.

Included in mapping were small areas of the wetter Pewamo soils in depressions and drainageways and small areas of Morley soils in the more strongly sloping areas.

A seasonal high water table is the main limitation for farming. Surface runoff is medium, and erosion is a hazard, particularly in the more strongly sloping areas. Seasonal wetness and slow permeability are limitations for many nonfarm uses. (Capability unit IIw-4)

Blount silt loam, 2 to 6 percent slopes, moderately eroded (BoB2).—This soil is mainly in areas adjacent to stream valleys. In many areas the slope is near the upper limit of the range. About half the original surface layer has been removed by erosion, and the present plow layer is a mixture of silt loam from the original surface layer and clay loam from the upper part of the subsoil. As a result, the plow layer is more sticky than that of uneroded Blount soils. It is low in organic-matter content and is susceptible to crusting. This soil is more droughty than any of the other Blount soils.

Included in mapping were small areas of the better drained Morley soils and a few severely eroded areas.

The severe erosion hazard is the main limitation for cultivated crops. Surface runoff is rapid, partly as a result of erosion. Unless artificially drained, the soil is seasonally wet in winter and spring and is slow to dry out in spring. Seasonal wetness and slow permeability are limitations for many nonfarm uses. (Capability unit IIIe-3)

Clay Pits

Clay pits (Cp) consists of excavated areas from which soil material has been removed for construction purposes. In most places the original soil profile has been altered, and in some places only a small amount of soil material remains. Some of the pits have shallow ponds that are used by wildlife, as well as for recreational purposes. The use of these areas for crops is not practical. (Not in a capability unit)

Colwood Series

The Colwood series consists of deep, nearly level, very poorly drained, dark-colored soils that formed in strata of silt and fine sand deposited in old glacial lakebeds. These soils occupy some areas of the lake plain and occur in a few places on beach ridges and stream terraces.

In a representative profile the soil material is dark-colored silt loam to a depth of 12 inches. The next layer is gray loam to a depth of 20 inches. Below this is mottled, light brownish-gray fine sandy loam. At a depth below 40 inches are stratified, calcareous very fine sand and silt and thin lenses of clay.

Surface runoff is slow to ponded, permeability is moderate, and the available moisture capacity is high. The water table is high for long periods in winter and spring. If adequately drained, these soils have a deep root zone. Reaction in the root zone is mostly neutral.

Soils of the Colwood series are used mainly for crops. They are seldom used for pasture or woodland.

Representative profile of Colwood silt loam in the SE¼ sec. 4, T. 2 S., R. 3 E. (Ridge Township).

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B1g—9 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; weak and moderate, fine and medium, subangular blocky structure; friable; many roots; neutral; clear, wavy boundary.

IIB21g—12 to 20 inches, gray (10YR 5/1) loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure; friable; many roots; neutral; clear, wavy boundary.

IIIB22g—20 to 40 inches, light brownish-gray (10YR 6/2) fine sandy loam; few, fine, faint mottles of yellowish brown (10YR 5/6 or 5/8); friable; structureless; neutral; gradual, irregular boundary.

IVCg—40 to 60 inches, gray (10YR 5/1) stratified fine sand and silt and thin lenses of clay; few, fine, distinct mottles of brownish yellow (10YR 6/6) and light yellowish brown (10YR 6/4); structureless; firm; moderately alkaline (calcareous).

The A horizon is silt loam in most places, but it is loam in some places. In most places it is 10YR 3/1 in color, but in some places it is 10YR 2/2 or 10YR 2/1. The Bg horizon is commonly heavy loam, fine sandy loam, silt loam, or light silty clay loam. Reaction throughout the solum is dominantly neutral, but in some places the Ap, B1g, and B21g horizons are slightly acid or mildly alkaline. The thickness and sequence of stratified materials are variable within short horizontal distances. The depth to calcareous material ranges from about 36 to 50 inches.

Colwood soils are similar to Kibbie soils in texture, but they are more poorly drained and darker colored. They contain more sand than the very poorly drained Toledo soils. They formed in material that is more silty than the material in which Millgrove soils formed.

Colwood silt loam (0 to 2 percent slopes) (Cw).—This soil occurs mainly as one rather large area on broad flats of the lake plain, not far from the beach ridges. Areas of this soil are adjacent to Hoytville soils in most places, but to a limited extent, they are also adjacent to areas of Kibbie soils.

Included in mapping were a few small areas that have a surface layer of loam.

Very poor natural drainage is the main limitation for both farm and nonfarm uses. When wet, this soil is soft and compressible, and when saturated, it tends to flow. (Capability unit IIw-5)

Cut and Fill Land

Cut and fill land (Cx) is a land type that occurs where soil material has been disturbed. In some areas the soil material has been moved or leveled. Other areas have been artificially filled with earth, trash, or both. In these ways the original soil profile has been altered, and the soil material now consists of a mixture of parent material and material from the original surface layer and subsoil. The farming potential of these areas is variable, but revegetated areas have some value for wildlife habitat and recreation. Onsite investigation is generally needed before the use of this land type can be determined. (Not in a capability unit)

Defiance Series

The Defiance series consists of nearly level, somewhat poorly drained soils that formed in fine-textured alluvium of the flood plains. These soils are on bottom lands where they are subject to flooding.

In a representative profile the plow layer is dark-gray silty clay loam about 8 inches thick. The soil material below the plow layer is mottled, grayish brown, and clayey to a depth of 48 inches or more.

Surface runoff is slow, and floodwater can cover these soils for prolonged periods. Permeability is slow because of the clayey, structureless soil material at moderate

depths. The available moisture capacity is high. The water table is seasonally high. The root zone is deep when the water table is low in summer or where it has been lowered by artificial drainage. The root zone is generally slightly acid to neutral.

Soils of the Defiance series in Van Wert County are of limited importance to farming. They can be drained artificially, but good outlets are not available in many areas.

Representative profile of Defiance silty clay loam in the NW¼ sec. 6, T. 2 S., R. 4 E. (Washington Township).

Ap—0 to 8 inches, dark-gray (10YR 4/1) silty clay loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B21g—8 to 20 inches, grayish-brown (10YR 5/2 silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/4 or 5/6); weak, medium, subangular blocky structure; very firm; neutral; diffuse, irregular boundary.

B22g—20 to 30 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; very firm; neutral; diffuse, wavy boundary.

Cg—30 to 48 inches, grayish-brown (10YR 5/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); structureless; very firm; neutral.

The A horizon is either silt loam or silty clay loam in texture and 10YR 4/1 or 10YR 4/2 in color. The Ap horizon is slightly acid or neutral. The B2g horizon ranges from heavy silty clay loam to clay in texture and from slightly acid to mildly alkaline in reaction. Pockets or strata of silt loam, loam, or clay loam occur in the B22g horizon or below it.

Defiance soils are similar to the very poorly drained Wabasha soils in texture, but they have a lighter colored surface layer. Soils of these two series are adjacent in many areas. Defiance soils are more clayey throughout the profile than the somewhat poorly drained Shoals soils.

Defiance silt loam (0 to 2 percent slopes) (De).—This soil occurs mainly as rather small, oval areas, but it also occurs as narrow, elongated areas that parallel the streams. It is on first bottoms. Areas of this soil are slightly above adjacent areas of Wabasha soils. The profile of this soil is similar to the one described as representative of the series, but the surface layer is more silty. Included in mapping were a few small areas of Defiance silty clay loam.

If adequately drained and protected from flooding, this soil is moderately well suited to most of the general crops commonly grown in the area. Because of the flooding hazard, especially in winter and early in spring, this soil is not well suited to wheat and oats. Tile drainage outlets are difficult to establish because there is not enough difference in grade between them and the level of the streams. Flooding and a seasonal high water table are limitations for most nonfarm uses. (Capability unit IIIw-4)

Defiance silty clay loam (0 to 2 percent slopes) (Df).—This soil ordinarily occurs as rather small, oval areas on the flood plains. It is flooded more frequently than Defiance silt loam. Areas of this soil are in slightly lower positions than areas of Defiance silt loam and are commonly adjacent to or surrounded by areas of Wabasha soils. This soil has the profile described as representative of the series. Its surface layer is more difficult to till than that of Defiance silt loam.

Flooding and the somewhat poor natural drainage are the main limitations for both farm and nonfarm uses. (Capability unit IIIw-4)

Digby Series

The Digby series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in loamy glacial material. This material is underlain by sand and gravel that contains varying quantities of silt and clay. These soils are on beach ridges, stream terraces, and outwash plains.

In a representative profile the plow layer is dark grayish-brown loam about 9 inches thick. The next layer, to a depth of 17 inches, is light yellowish-brown clay loam that is mottled with brownish yellow and has grayish-brown coatings. Below this, to a depth of 35 inches, is mottled brown and dark grayish-brown sandy clay loam that contains varying quantities of pebbles. The layer of gray sand and fine gravel at a depth between 35 and 60 inches is commonly called "dirty" because it contains varying quantities of silt and clay.

Permeability is moderate. The water table is seasonally high, and the soils are saturated for significant periods in winter and spring. The root zone is deep when the water table is low in summer or where it has been lowered by artificial drainage. Within the root zone, the available moisture capacity is medium. Reaction is mostly very strongly acid to strongly acid in the root zone, but it is less acid with increasing depth.

Most soils of the Digby series are used for farming, but artificial drainage is needed for satisfactory crop production.

Representative profile of Digby loam in the SW¼NE¼ sec. 10, T. 2 S., R. 2 E. (Pleasant Township).

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable; common roots; slightly acid; abrupt, smooth boundary.

B1t—9 to 17 inches, light yellowish-brown (10YR 6/4) clay loam; few, fine, faint mottles of brownish yellow (10YR 6/6); weak, fine and medium, subangular blocky structure; friable; few roots; grayish-brown (10YR 5/2) clay coatings on ped surfaces; common fine pebbles; very strongly acid; gradual, wavy boundary.

B21t—17 to 22 inches, brown (10YR 5/3) sandy clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; firm; thin, patchy clay films on ped surfaces; dark grayish-brown (10YR 4/2) coatings on peds; common fine pebbles; strongly acid; diffuse, wavy boundary.

B22t—22 to 35 inches, dark grayish-brown (10YR 4/2) sandy clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); weak, fine and medium, subangular blocky structure; firm; thin, patchy clay films; common fine pebbles; medium acid; diffuse, irregular boundary.

C—35 to 60 inches, gray (10YR 5/1) sand and fine gravel and a high content of fine-textured material; single grain; loose; moderately alkaline (calcareous).

The A horizon is sandy loam or loam in texture and ranges from 10YR 4/1 and 4/2 to 10YR 5/1 and 5/2 in color. The B1t horizon is clay loam, silty clay loam, or sandy clay loam. The B2t horizon is light clay loam or sandy clay loam in most places, but it is heavy clay loam in some places. Reaction is very strongly acid in the upper part of the solum to neutral in the lower part. The depth to sand and gravel is commonly 34 or 35 inches, but it ranges from 25 to 42 inches. Where Digby soils occur on stream terraces, they generally have a C horizon of "dirty" sand and gravel, but in some places they have a C horizon of clean, stratified gravel and sand. Where they occur on beach ridges, they ordinarily have a IIC horizon of calcareous clay glacial till or clay loam glacial till at a depth

below 48 inches. Where Digby soils occur as overwash or "smears," on till plains, the course fraction is commonly made up only of sand.

Digby soils are the somewhat poorly drained soils in a drainage sequence with the well-drained Belmore soils, the moderately well-drained Haney soils, and the very poorly drained Millgrove soils. Digby soils are lighter colored than Millgrove soils. The upper part of their B horizon is grayer and more mottled than that of Belmore and Haney soils. Digby soils are coarser textured and contain more fine gravel than Kibbie soils.

Digby sandy loam, 0 to 2 percent slopes (DgA).—This soil is mostly on the till plain, where sandy deposits are thinner than on beach ridges or stream terraces. It has a sandier profile than the one described as representative of the series. Areas of this soil occur with areas of Blount and Pewamo soils. Included in mapping were small areas of the less sandy Digby loam.

Seasonal wetness is the dominant limitation for farming, as well as for many nonfarm uses. This soil is easy to cultivate and is in good tilth. Erosion is not a hazard. (Capability unit IIw-3)

Digby sandy loam, 2 to 6 percent slopes (DgB).—This soil occurs mostly as small areas and only on low knolls of the till plain. It has a sandier profile than the one described as representative of the series. Areas of this soil are commonly adjacent to areas of Blount or Morley soils.

Seasonal wetness is the main limitation for farming, as well as for many nonfarm uses. Surface runoff is medium, and there is a hazard of erosion in areas near the upper limit of the slope range. Some spots are moderately eroded. This soil is commonly managed with adjacent soils because most areas are too small to manage separately. (Capability unit IIw-3)

Digby loam, 0 to 2 percent slopes (DmA).—This soil typically occurs as long, narrow, winding areas, generally on low-lying beach ridges and on slightly elevated flats on stream terraces. The winding pattern conforms to that of the ridges and stream terraces. Commonly, areas of this soil are adjacent to areas of Haney and Millgrove soils and, less commonly, to areas of Haskins and Mermill soils. This soil has the profile described as representative of the series.

Included in mapping were small areas where the slopes are 2 to 6 percent and small areas of Haskins loam where there is contrasting clayey material at depths of less than 40 inches.

Seasonal wetness is the main limitation for both farm and nonfarm uses. Surface runoff is slow, and the erosion hazard is slight. Tilth of the surface layer is good. (Capability unit IIw-3)

Digby loam, 2 to 6 percent slopes (DmB).—This soil is most commonly near the base of flanks of major beach ridges, but it also occurs on stream terraces and outwash plains. On the beach ridges and stream terraces, it generally occurs as elongated areas adjacent to areas of Haskins, Millgrove, Mermill, or Haney soils. On outwash plains, it generally occurs as oval areas adjacent to areas of Haskins, Blount, and Morley soils.

Included in mapping were areas of soils where the surface layer is siltier than that of this soil, as well as small areas of Haskins loam where contrasting clayey material occurs at depths of less than 40 inches. Also included were a few small areas where the surface layer is gravelly.

Seasonal wetness is the main limitation for both farm and nonfarm uses. Surface runoff is medium, and erosion is a hazard in cultivated areas. The soil generally has good tilth and is easy to cultivate. (Capability unit IIw-3)

Eel Series

The Eel series consists of nearly level, moderately well drained soils that formed in recent alluvium. These soils are on bottom lands along the St. Marys River and its tributaries. They are subject to flooding in winter and spring. These are the only moderately well drained soils that occur on flood plains in the county.

In a representative profile the plow layer is dark grayish-brown silt loam about 8 inches thick. Below this, to a depth of 30 inches, is dark-brown silt loam mottled with dark gray at a depth below 19 inches. At a depth below 30 inches is mottled dark-brown loam. The gray mottles indicate seasonal wetness.

Permeability is moderate, and the available moisture capacity is high. The water table is high for short periods in winter and spring, but seasonal wetness is generally not a limitation. The root zone is deep and is neutral in reaction.

Although not extensive, soils of the Eel series are important to farming. The areas that are large enough to farm are generally used for row crops. Smaller areas are used for pasture or woodland.

Representative profile of Eel silt loam in the NW¼ sec. 32, T. 3 S., R. 1 E. (Willshire Township).

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

B1–8 to 19 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, subangular blocky structure; friable; neutral; gradual, wavy boundary.

B2—19 to 24 inches, dark-brown (10YR 4/3) silt loam; few, fine, faint mottles of dark gray (10YR 4/1); weak, medium and fine, subangular blocky structure; friable; slightly acid; diffuse, wavy boundary.

B3—24 to 30 inches, dark-brown (10YR 4/3) silt loam; few, fine, faint mottles of dark gray (10YR 4/1); weak, medium, subangular blocky structure; friable; slightly acid; gradual, irregular boundary.

C—30 to 48 inches, dark-brown (10YR 4/3) loam; common, fine, faint mottles of dark gray (10YR 4/1) and yellowish brown (10YR 5/4); massive; friable; neutral.

In places the A horizon is loam instead of silt loam. The colors in the Ap horizon include 10YR 4/2, 4/3, and 5/3. The C horizon is dominantly 10YR 3/3 and 4/3 in color. It is loam, silt loam, or light silty clay loam in texture and has lenses or layers of sandy loam. The depth to mottling ranges from 15 to 20 inches. Reaction ranges from slightly acid to neutral throughout the profile.

Eel soils are commonly adjacent to the more poorly drained Shoals and Sloan soils, but they are less gray throughout the profile and generally occupy slightly higher positions on the flood plain. They are less clayey than Sloan soils.

Eel silt loam (0 to 2 percent slopes) (Em).—This soil is ordinarily in slightly elevated positions on first bottoms. Most of the acreage is on the flood plain of the St. Marys River. Most areas are accessible for farming, but there are a few isolated areas that are difficult to reach.

Included in mapping were areas where the surface layer is loam, about 10 inches thick, that appears to be recent overwash. Also included were small ribbonlike areas on the side slopes of abandoned oxbows, where the slope is more than 2 percent. A few well-drained areas were also included.

Flooding is the main limitation, both for farm and nonfarm uses. (Capability unit IIw-1)

Elliott Series

The Elliott series consists of nearly level to gently sloping, somewhat poorly drained, dark-colored soils. These soils occur on uplands of the glacial till plain and are widely scattered throughout the county.

In a representative profile the surface layer is very dark gray silt loam about 11 inches thick. The next layer is dark yellowish-brown silty clay loam to a depth of 18 inches, and below this is yellowish-brown silty clay. At depths below 27 inches, the underlying material is yellowish-brown, very firm, calcareous clay loam glacial till. Distinct, dark grayish-brown mottles occur at depths below 11 inches.

Permeability is slow. The water table is high in spring and winter. The root zone is moderately deep, has medium available moisture capacity, and is medium acid to neutral in reaction. Reaction becomes less acid with increasing depth.

Soils of the Elliott series are used mostly for crops, mainly corn and soybeans. Artificial drainage helps to reduce seasonal wetness.

Representative profile of Elliott silt loam in the SE¼ sec. 28, T. 2 S., R. 3 E. (Ridge Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, fine and coarse, granular structure; friable; many roots; neutral; clear, smooth boundary.

A3—8 to 11 inches, very dark gray (10YR 3/1) silt loam; weak, fine and medium, subangular blocky structure; friable; many roots; slightly acid; clear, wavy boundary.

B1tg—11 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, medium, distinct mottles of dark grayish brown (10YR 4/2); moderate, fine and medium, subangular blocky structure; friable; common roots; continuous, dark-gray (10YR 3/1) coatings that are, in part, thin, patchy clay films; slightly acid; gradual, wavy boundary.

B2tg—18 to 27 inches, yellowish-brown (10YR 5/4) silty clay; medium, common, distinct mottles of black (10YR 2/1) and dark grayish brown (10YR 4/2); moderate, fine to coarse, subangular blocky structure; firm; thin, continuous clay films; few roots; neutral; clear, smooth boundary.

C—27 to 60 inches, yellowish-brown (10YR 5/6) clay loam; common, coarse, distinct mottles of dark gray (10YR 4/1) and light brownish gray (10YR 6/2); massive; very firm; moderately alkaline (calcareous).

The A horizon is 10YR 2/1, 10YR 3/2, or 10YR 3/1 in color. Colors that have a value of less than 3.5 extend to depths ranging from 10 to 14 inches. The A horizon ranges from 3 to 5 percent in content of organic matter and is either slightly acid or neutral in reaction. The B1 horizon is silty clay loam, clay loam, or loam in texture and slightly acid or neutral in reaction. The B2 horizon is clay or silty clay. The depth to carbonates is between 25 and 35 inches in most places, but it ranges from 20 to 40 inches.

Elliott soils are commonly in an intermediate position between the light-colored Blount soils and the dark-colored, very poorly drained Pewamo soils. They differ from Blount soils in having a dark-colored surface layer and less acid reaction in the upper part of the B horizon. They have brighter colors in the B horizon than Pewamo soils.

Elliott silt loam, 0 to 4 percent slopes (EoB).—This soil is on the till plains. Areas of this soil are near or adjacent to areas of Blount and Pewamo soils in most places but are adjacent to areas of Montgomery soils in some places. Included in mapping were a few areas of light-colored Blount silt loam and areas of the wetter Pewamo silty clay loam that are generally in the flat areas.

Seasonal wetness is the main limitation for both farm and nonfarm uses, but slow permeability is also a limitation for many nonfarm uses. Surface runoff is slow to medium. Surface tilth is generally good. (Capability unit IIw-4)

Haney Series

The Haney series consists of nearly level to gently sloping, moderately well drained soils that formed in loamy glacial outwash. These soils are underlain by poorly sorted sand and gravel that contains variable amounts of silt and clay. They are on beach ridges and remnants of beach ridges, on stream terraces, and in small, scattered areas of the Fort Wayne terminal moraine.

In a representative profile the surface layer is dark grayish-brown loam about 11 inches thick. The next layer, to a depth of 18 inches, is dark-brown loam. Below this is mottled, yellowish-brown clay loam. The grayish mottles in this layer are indicators of soil wetness. At a depth below 36 inches is mottled yellowish-brown, yellow, gray, and strong-brown, "dirty" sandy and gravelly material.

Ordinarily, these soils are saturated for only short periods in winter and spring. Permeability is moderate, and the available moisture capacity is medium. The root zone is deep and is medium acid to slightly acid. Acidity decreases with increasing depth.

Soils of the Haney series are used for the commonly grown field crops. They are commonly used for building sites because they are generally on beach ridges where they are higher than the nearby, more poorly drained soils.

Representative profile of Haney loam in the SW¼SE¼ sec. 27, T. 3 S., R. 1 E. (Willshire Township).

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable; few fine pebbles; slightly acid; abrupt, smooth boundary.

A2—8 to 11 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, platy structure; friable; few fine pebbles; medium acid; clear, wavy boundary.

B1t—11 to 18 inches, dark-brown (7.5YR 4/4) loam; weak and moderate, fine and very fine, subangular blocky structure; friable; thin, patchy clay films and bridging between sand grains; few fine pebbles; medium acid; diffuse, wavy boundary.

B21t—18 to 24 inches, yellowish-brown (10YR 5/4) clay loam; few, fine, distinct mottles of dark grayish brown (10YR 4/2); moderate, medium, subangular blocky structure; firm; thin, patchy clay films and some bridging between sand grains; firm; common fine pebbles; medium acid; diffuse, wavy boundary.

B22t—24 to 36 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); weak and moderate, fine and medium, subangular blocky structure; firm; thin, continuous clay films and some bridging between sand grains; common fine pebbles, but a larger quantity than in the B21t horizon; slightly acid; diffuse, irregular boundary.

C—36 to 50 inches, mottled yellowish-brown (10YR 5/8), yellow (10YR 7/6), gray (10YR 5/1), and strong-brown (7.5YR 5/6) sandy and gravelly material and variable quantities of silt and clay; single grain; moderately alkaline (calcareous).

The A horizon is loam or sandy loam. The Ap and A2 horizons are 10YR 4/2, 4/3, 5/2, 5/3, and 6/2 in color. The B1t horizon is loam, fine sandy loam, or silty clay loam in texture, and the B2t horizon is clay loam, sandy clay loam, or gravelly clay loam. The solum is mostly medium acid to slightly acid, but the B22t horizon is slightly acid to neutral.

The depth to the gravelly C horizon is about 35 or 36 inches in most places, but the depth ranges from about 25 to 38 inches. On beach ridges, these soils commonly have a IIC horizon of calcareous clay glacial till or clay loam glacial till at a depth below 48 inches. On stream terraces, they have a C horizon that, in places, gradually grades to clean, stratified gravel and sand of the IIC horizon. On both the ridges and the terraces, the coarse fraction generally contains variable quantities of water-worn gravel. On the till plains, these soils occupy overwash or "smear" areas and they commonly contain more sand and less gravel than is typical.

Haney soils are the moderately well drained soils in a drainage sequence with the well-drained Belmore soils, the somewhat poorly drained Digby soils, and the very poorly drained Millgrove soils. Haney soils are wetter than Belmore soils. They are less mottled and less gray than Digby soils. They are lighter colored than Millgrove soils. Haney soils are similar to Rawson soils in natural drainage, but they formed in loamy glacial outwash that is thicker than that in which Rawson soils formed. The depth to clayey material is more than 40 inches in Haney soils and less than 40 inches in Rawson soils.

Haney sandy loam, 2 to 6 percent slopes (HaB).—This soil generally occurs as oval or elongated areas, mainly on stream terraces and outwash plains in the southern part of the county. The shape of these areas tends to conform to that of the stream valleys or moraines. The profile of this soil is similar to the one described as representative of the series, but the surface layer is sandier. This soil dries out more quickly and is more droughty than Haney loam.

Included in mapping were a few areas where the sand fraction of the surface layer is finer than is typical. Also included were a few small areas, some of which are moderately eroded.

A moderate erosion hazard is the main limitation for farming. Surface runoff is slow to medium, largely because water moves into this soil readily. This soil is easy to cultivate. Slope is a limitation for some nonfarm uses. (Capability unit IIe–1)

Haney loam, 0 to 2 percent slopes (HdA).—This soil is mainly in flat areas of the beach ridges and stream terraces. Areas of this soil are commonly adjacent to areas of Belmore, Digby, or other Haney soils. This soil is less droughty than other Haney soils.

Included in mapping were small oval areas or irregularly shaped areas of soil where the surface layer is silt loam, mainly on slightly elevated stream terraces in the southern part of the county. Also included were a few areas where the slope is 2 to 6 percent and a few areas of Rawson loam.

This soil has no significant limitations for most farm and nonfarm uses. Surface tilth is good. (Capability unit I–1)

Haney loam, 2 to 6 percent slopes (HdB).—This soil occurs as elongated areas, mainly along the flanks of beach ridges but also on stream terraces and on outwash plains. The shape of these areas generally conforms to the local topography of the beach ridges or stream terraces. This soil has the profile described as typical of the series.

Included in mapping were small, elongated areas of a gently sloping soil on stream terraces and outwash plains. This soil has a surface layer of silt loam and is more susceptible to surface crusting than is Haney loam. Also included were a few small areas where the slope is 6 to 12 percent. These areas are on stream terraces. They are rarely cultivated, because of their short slopes and the inaccessibility of the adjacent bottom lands. Other inclusions were a few small areas, mainly on the northern side of beach ridges, of seepy soils that are reddish in color.

Surface runoff is medium in most places, and consequently, the erosion hazard is moderate in cultivated areas. Slope is a limitation for some nonfarm uses. (Capability unit IIe–1)

Haskins Series

The Haskins series consists of nearly level to gently sloping, somewhat poorly drained soils that formed partly in medium-textured or moderately fine textured outwash and partly in underlying finer textured glacial till or lacustrine material. These soils are on beach ridges, stream terraces, and low knolls of the till plains.

In a representative profile the plow layer is dark grayish-brown loam about 8 inches thick, and directly below this is a thin layer of brown loam. Layers of mottled brown, dark grayish-brown, and grayish-brown, sticky sandy clay loam occur at depths between 14 and 32 inches. The underlying material is contrasting to the soil material at depths of about 32 inches; it is less sandy and more silty and clayey.

The water table is perched in winter and spring when water tends to accumulate above the contrasting lower layers that formed in weathered, calcareous clay loam glacial till. Permeability is moderate in the upper part of the profile and slow in the lower part. The available moisture capacity is medium. The root zone is moderately deep. Reaction is strongly acid in the upper part of the root zone and neutral in the lower part.

Haskins soils are used mainly for farming. Corn and soybeans are the principal crops. In most places artificial drainage is beneficial to crops.

Representative profile of Haskins loam in the SE¼ sec. 32, T. 3 S., R. 2 E. (Liberty Township).

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine and medium, granular structure; very friable; strongly acid; abrupt, smooth boundary.

A2—8 to 10 inches, brown (10YR 5/3) loam; few, medium, distinct mottles of yellowish brown (10YR 5/4 or 5/6); weak, fine, subangular blocky structure; very friable; strongly acid; diffuse, wavy boundary.

B1t—10 to 14 inches, grayish-brown (10YR 5/2) loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); moderate, fine and medium, subangular blocky structure; friable; thin, patchy clay films; strongly acid; diffuse, wavy boundary.

B21t—14 to 17 inches, brown (10YR 5/3) sandy clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; thin, patchy clay films on vertical surfaces; strongly acid; diffuse, irregular boundary.

B22t—17 to 22 inches, dark grayish-brown (10YR 4/2) sandy clay loam; many, medium, distinct mottles of yellowish brown (10YR 4/4); weak, fine and medium, subangular blocky structure; firm; thin, continuous clay films; medium acid; diffuse, wavy boundary.

B23t—22 to 27 inches, grayish-brown (10YR 5/2) sandy clay loam; common, fine and medium, faint mottles of brown (10YR 5/3) and yellowish brown (10YR 5/4 or 5/6); weak, fine and medium, subangular blocky structure; firm; thin, continuous clay films; neutral; clear, irregular boundary.

B24t—27 to 32 inches, dark yellowish-brown (10YR 4/2) clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and very dark brown (10YR 2/2); weak, medium, subangular blocky structure; firm; thin, continuous clay films on vertical ped surfaces; neutral; abrupt, wavy boundary.

IIB3t—32 to 38 inches, grayish-brown (10YR 5/4) silty clay; common, medium, faint mottles of dark grayish brown (10YR 4/2); weak, medium and coarse, subangular blocky structure; plastic; thin, continuous clay films on all ped surfaces; neutral; gradual, wavy boundary.

IIC—38 to 60 inches, dark grayish-brown (10YR 4/2) clay loam; common, medium, distinct mottles of brown (10YR 5/3); massive; very firm and compact; moderately alkaline (calcareous).

The colors in the Ap horizon have a hue of 10YR, a value of 4, and a chroma of 2 or 3. The matrix colors in the A2 horizon have a hue of 10YR, a value of 5, and a chroma of 2 or 3. The B1t horizon ranges from heavy sandy loam to light clay loam in texture, and the B2t horizon, from sandy loam to heavy clay loam. The IIBt horizon is generally less than 8 inches thick. The IIC horizon is clay loam, silty clay loam, or clay. Where these soils are on or near beach ridges and stream terraces, they have fine pebbles throughout the solum, except in the IIBt horizon. Where these soils are on till plains, they have no pebbles in the solum and the coarse material is sandy. The depth to the contrasting IIBt horizon is 30 to 42 inches in most places, but it ranges from 24 to 42 inches.

Haskins soils are the somewhat poorly drained soils in a drainage sequence with the moderately well drained Rawson soils and the very poorly drained Mermill soils. Haskins soils differ from Digby soils in having contrasting finer textured material at depths of less than 42 inches. They are coarser textured than Kibbie soils.

Haskins fine sandy loam, 0 to 2 percent slopes (HkA).—This soil occurs as rather small areas, 2 to 5 acres in size, mainly in slightly elevated areas of the till plain. The areas are numerous in the southern part of the county. Areas of this soil are adjacent to or near areas of Blount and Pewamo soils. The profile of this soil is similar to the one described as representative of the series, but the surface layer is coarser texteured. The surface layer of this soil dries out more quickly than that of Haney loam.

Included in mapping were small areas of Digby soils, which are deeper to contrasting finer material than Haskins soils.

Seasonal wetness is the main limitation for both farm and nonfarm uses. Surface runoff is slow, and erosion is not a hazard. The tilth of the surface layer is good. (Capability unit IIw–3)

Haskins fine sandy loam, 2 to 6 percent slopes (HkB).—This soil occurs mainly as narrow, elongated areas on stream terraces and as irregularly shaped areas on outwash plains. Areas of this soil are near areas of Digby and Blount soils. The profile of this soil is similar to the one described as representative of the series, but the surface layer is sandier.

Seasonal wetness is the main limitation for both farm and nonfarm uses, but slope is also a limitation for some nonfarm uses. Surface runoff is slow, but erosion is a hazard, particularly in winter and spring when the soil is saturated. (Capability unit IIw–3)

Haskins loam, 0 to 2 percent slopes (HnA).—This soil occurs mainly as elongated areas on low-lying beach ridges on the lake plain north of U.S. Route 30, but it also occurs as small oval areas or irregularly shaped areas scattered across the ground moraines. Areas of this soil are mainly near areas of Mermill, Digby, Nappanee, and Hoytville soils, but they are also near or adjacent to areas of Blount and Pewamo soils on the till plains. This soil has the profile described as representative of the series.

Included in mapping were small areas of Mermill, Digby, Nappanee, and Hoytville soils.

Seasonal wetness is the main limitation for both farm and nonfarm uses. Surface runoff is slow, and the hazard of erosion is slight. Tilth of the surface layer is generally good. (Capability unit IIw–3)

Haskins loam, 2 to 6 percent slopes (HnB).—This soil is mainly on low-lying beach ridges and terraces adjacent to streams, but it also occurs as isolated, irregularly shaped areas at some of the higher elevations on the till plains. Areas of this soil are commonly near areas of Digby, Hoytville, Nappanee, Mermill, Blount, and Pewamo soils. Included in mapping were small areas of Digby, Hoytville, Nappanee, Mermill, Blount, and Pewamo soils.

Seasonal wetness and an erosion hazard in cultivated areas are the principal limitations for farming. Seasonal runoff is medium. Seasonal wetness and slope are limitations for some nonfarm uses. (Capability unit IIw–3)

Hoytville Series

The Hoytville series consists of nearly level, very poorly drained, dark-colored soils that formed in water-worked, calcareous glacial till. These soils are on the lake plain north of U.S. Route 30.

In a representative profile the surface layer is very dark gray clay about 8 inches thick. Below this is mottled dark-gray or gray clay to a depth of 48 inches. Below this is compact, calcareous clay glacial till.

Permeability is moderately slow in the uppermost 3 or 4 feet of the profile and slow in the underlying till. The available moisture capacity is high. The water table is high in winter and spring because the soils are in areas where water tends to accumulate. In summer or if adequate drainage has been provided, the root zone is deep. Reaction in the root zone is neutral. The content of organic matter is moderately high.

Soils of the Hoytville series are farmed intensively. Corn, soybeans, sugar beets, and tomatoes are the main crops grown. Artificial drainage is beneficial to crops, and at present, most areas are drained.

Rrepresentative profile of Hoytville clay in the NW¼ sec. 35, T. 1 S., R. 2 E. (Union Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) clay; moderate, medium and coarse, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B21tg—8 to 12 inches, dark-gray (10YR 4/1) silty clay; many, fine, distinct mottles of dark yellowish brown (10YR 4/4); strong, medium, subangular blocky structure; very firm; thin, patchy clay films; neutral; diffuse, wavy boundary.

B22tg—12 to 22 inches, dark-gray (10YR 4/1) clay; common, fine, faint mottles of dark grayish brown (10YR 4/2); strong, fine and medium, subangular blocky structure; very firm; thin, continuous clay films on vertical surfaces; neutral; gradual, wavy boundary.

B23tg—22 to 48 inches, gray (10YR 5/1) clay; common, medium, distinct mottles of light olive brown (2.5Y 5/6); moderate, fine, subangular blocky structure; very firm; thin, continuous clay films on vertical surfaces; neutral; abrupt, irregular boundary.

C—48 to 68 inches, gray (10YR 5/1) clay; common, coarse, distinct mottles of yellowish brown (10YR 5/4 or 5/6); massive; moderately alkaline (calcareous).

The A horizon is clay or silty clay loam. It is 10YR 3/1, 10YR 3/2, or 10YR 2/2 in color, and it ranges from 7 to 9 inches in thickness. It is slightly acid to neutral. In the B2tg horizon, the dominant color hues range from 10YR to 2.5Y or 5Y, and the texture is clay or silty clay. Reaction in this horizon is slightly acid to mildly alkaline. The depth to calcareous till is about 44 inches in most places, but it ranges from about 32 to 55 inches.

Hoytville soils are the very poorly drained soils in a drainage sequence with the moderately well drained St. Clair soils and the somewhat poorly drained Nappanee soils. Hoytville soils are darker colored and much more poorly drained than the St. Clair and Nappanee soils. They differ from Toledo soils in having formed in glacial till and in having a Bt horizon. Hoytville soils have a thinner dark-colored surface layer than Pewamo soils; their surface layer is less than 10 inches thick.

Hoytville clay (0 to 2 percent slopes) (Hv).—This soil is commonly on broad, depressed flats of the lake plain. It has the profile described as representative of the series. This soil is more readily ponded than Hoytville silty clay loam.

Included in mapping were small areas of the light-colored, somewhat poorly drained Nappanee soils on knolls that are slightly elevated above the broad flats.

Very poor natural drainage, clayey texture of the surface layer, and slow permeability are limitations for both farm and nonfarm uses. Good tilth is hard to maintain because of the clayey surface layer. (Capability unit IIw-6)

Hoytville silty clay loam (0 to 2 percent slopes) (Ho).—This soil is mostly on flats between or near beach ridges or the remnants of beach ridges. Areas of this soil are generally near or adjacent to areas of Nappanee and St. Clair soils. The profile of this soil is similar to the one described as representative of the series, but the surface layer is less clayey. This soil has better tilth than Hoytville clay.

Included in mapping were rather small areas where the surface layer is silt loam to a depth of 10 or 12 inches. These areas are adjacent to the beach ridges or the remnants of beach ridges and have a thicker surface layer because they have received a thin overwash of soil material from the beach ridges. Also included were rather small areas where the slope is 2 to 6 percent. These areas occur on the lower parts of beach ridges and along small, intermittent drainageways where uplands adjoin the flood plains of major streams.

Very poor natural drainage and slow permeability are the main limitations for both farm and nonfarm uses. Surface runoff is slow to ponded. (Capability unit IIw-6)

Hoytville Series, Moderately Shallow Variant

The Hoytville series, moderately shallow variant, consists of very poorly drained soils. These soils are in areas of the lake plain where glacial till is relatively thin over bedrock. The bedrock is at a depth of 20 to 40 inches.

In a representative profile the plow layer is very dark gray silty clay loam about 9 inches thick. Below this is mottled, dark-gray silty clay. Limestone bedrock is at a depth of 32 inches.

The water table is high in winter and spring. Permeability is moderately slow to slow. The content of organic matter is moderately high. The root zone is moderately deep, and reaction in the root zone is neutral.

Soils of the Hoytville series, moderately shallow variant, are farmed intensively in most areas.

Representative profile of Hoytville silty clay loam, moderately shallow variant, in the NW¼ sec. 9, T. 1 S., R. 2 E. (Union Township).

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; strong, fine and medium, subangular blocky structure; friable; slightly acid; abrupt, smooth boundary.

B21tg—9 to 20 inches, dark-gray (10YR 4/1) silty clay; few, fine, faint mottles of dark brown (10YR 4/3); strong, medium and coarse, subangular blocky structure; very firm; thin, patchy clay films on ped surfaces; neutral; diffuse, irregular boundary.

B22tg—20 to 32 inches, dark-gray (10YR 4/1) silty clay; common, medium, faint and distinct mottles of dark brown (10YR 4/3) and yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; very firm; thin, continuous clay films on vertical surfaces; neutral; abrupt, wavy boundary.

IIR—32 to 40 inches +, weathered limestone bedrock.

The Ap horizon is 10YR 3/1, 10YR 3/2, or 10YR 2/2 in color and is slightly acid to neutral. The B2tg horizon is clay or silty clay in texture. It is neutral in most places, but it ranges from slightly acid to mildly alkaline. The depth to limestone bedrock is 30 to 36 inches in most places, but it ranges from 20 to 40 inches.

Hoytville soils, moderately shallow variant, are adjacent to typical Hoytville soils, and they differ only in being shallower to bedrock.

Hoytville silty clay loam, moderately shallow variant (0 to 2 percent slopes) (Hs).—This soil has better tilth than Hoytville clay. Limestone bedrock is within 40 inches of the surface.

Very poor natural drainage, limited depth to bedrock, and slow permeability are limitations for most farm and many nonfarm uses. Surface runoff is slow to ponded, and tile and surface drains are beneficial both for farming operations and for crops. In some places the moderate depth to limestone bedrock interferes with the installation of tile. (Capability unit IIIw-2)

Kibbie Series

The Kibbie series consists of deep, nearly level, somewhat poorly drained soils that formed in strata of silt and fine sand that had been deposited in old glacial lakebeds. These soils are on the lake plain.

In a representative profile the plow layer is dark grayish-brown silt loam about 6 inches thick. Below this is mottled, grayish-brown silt loam or loam. At a depth of 15 inches is clay loam that is dark grayish brown in the uppermost part and grayish brown in the lower part. Below this, at a depth of 35 inches, is yellowish-brown soil material that consists of stratified silt and sand and thin lenses of clay. Permeability is moderate, and the available moisture capacity is high. The water table is seasonally high in spring or has been lowered by artificial drainage. When the water table is low, the root zone is deep. Reaction in the root zone is medium acid to neutral.

Artificial drainage helps to reduce seasonal wetness and is beneficial to crops.

Representative profile of Kibbie silt loam in the SE¼ sec. 4, T. 2 S., R. 3 E. (Ridge Township).

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—6 to 10 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint mottles of light yellowish brown (10YR 6/4); weak, fine and very fine, subangular blocky structure; friable; slightly acid; gradual, wavy boundary.

B1—10 to 15 inches, grayish-brown (10YR 5/2) loam; common, coarse, distinct mottles of strong brown (7.5YR 5/6); moderate, fine, subangular blocky structure; friable; slightly acid; diffuse, wavy boundary.

B21t—15 to 21 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); strong, fine and medium, subangular blocky structure; firm; thin, patchy clay films on horizontal surfaces, and patchy clay films on most vertical surfaces; slightly acid; diffuse, wavy boundary.

B22t—21 to 29 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; strong, medium and coarse, subangular blocky structure; firm; thin, patchy clay films on horizontal surfaces and continuous clay films on vertical surfaces; neutral; diffuse, wavy boundary.

B23t—29 to 35 inches, grayish-brown (10YR 5/2) light silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; friable; thin, patchy clay films on vertical surfaces; neutral; clear, irregular boundary.

C—35 to 60 inches, yellowish-brown (10YR 5/4) silt loam; common, coarse, faint mottles of yellowish brown (10YR 5/6); massive to weak, medium, subangular blocky structure; friable; many thin strata of silt and fine sand; moderately alkaline (calcareous).

The Ap horizon is silt loam in most places, but it is fine sandy loam in some places. The B1 horizon is loam, silt loam, or fine sandy loam. The B2t horizon is light silty clay loam, silt loam, or fine sandy loam and contains not more than 33 percent clay. Reaction generally ranges from medium acid to slightly acid in the A and B1 horizons and from slightly acid to neutral in the B2t horizon. The depth to carbonates is about 36 inches in most places, but it ranges from 30 to 48 inches. The horizons vary considerably in thickness. Variable amounts of very fine sand may occur in any horizon. In some places small pockets, as much as 6 inches in diameter, of silt, fine gravel, and sand occur in the lower horizons.

Kibbie soils are the somewhat poorly drained soils in a drainage sequence with the very poorly drained Colwood soils. They are better drained and lighter colored than Colwood soils. They have a less clayey B horizon than Nappanee or Blount soils. Kibbie soils differ from the somewhat poorly drained Haskins soils in not having a IIB horizon.

Kibbie silt loam (0 to 2 percent slopes) (Ks).—This soil occurs on slightly elevated flats of the lake plain and as rather small oval areas on the outwash plains. Areas of this soil are generally adjacent to areas of the very poorly drained, dark-colored Colwood soils on the lake plain and to areas of the coarser textured, somewhat poorly drained Digby soils on the outwash plains.

Included in mapping were a few areas of Blount silt loam, a few areas where the slope is more than 2 percent, and a few areas where the surface layer is fine sandy loam. Also included were areas of a soil that has a dark-colored surface layer.

A seasonal high water table is the main limitation for both farm and nonfarm uses. Surface runoff is slow. Unless drained, the soil is slow to dry out in spring. It is generally low in content of organic matter and, consequently is subject to surface crusting in cultivated areas. The included areas of fine sandy loam and those that have a dark-colored surface layer generally have good tilth. Erosion is a hazard in the included gently sloping areas. (Capability unit IIw-3)

Latty Series

The Latty series consists of nearly level, very poorly drained soils that formed either in clayey sediments laid down in old glacial lakes or in a mixture of glacial till and clayey sediments. These soils are mostly clayey throughout the profile, and they are among the soils in the county that contain the most clay. They occupy flats in the northeastern part of the county.

In a representative profile the plow layer is dark-gray clay about 7 inches thick. The soil material, to a depth of 42 inches, is mostly grayish clay that has distinct, yellowish-brown mottles. It is very sticky and very firm. Below this, the underlying material is light-gray, extremely firm, calcareous clay that is a mixture of glacial till and clayey sediments.

These soils are wet for long periods, especially in winter and spring. Permeability is very slow to slow, and the available moisture capacity is medium. It is more difficult for plant roots to penetrate these soils than soils that contain less clay. Reaction in the root zone is neutral.

Soils of the Latty series are important for farming in this county. The main crops are corn and soybeans.

Representative profile of Latty clay in the NW¼ sec. 8, T. 1 S., R. 4 E. (Jackson Township).

Ap—0 to 7 inches, dark-gray (10YR 4/1) clay; strong, fine and medium, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B21g—7 to 17 inches, dark-gray (10YR 4/1) clay; few, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, fine and medium, subangular blocky structure; very firm; neutral; gradual, wavy boundary.

B22g—17 to 23 inches, grayish-brown (10YR 5/2) clay; common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; very firm; neutral; gradual, wavy boundary.

B23g—23 to 38 inches, gray (10YR 5/1) clay; many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; very firm; neutral; gradual, irregular boundary.

B24g—38 to 42 inches, gray (10YR 5/1) clay; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); weak, medium, subangular blocky structure; very firm; neutral; abrupt, irregular boundary.

IICg—42 to 60 inches, light-gray (10YR 6/1) clay; many, medium, distinct mottles of yellowish brown (10YR 5/8); massive; extremely firm; moderately alkaline (calcareous).

The A horizon is clay or silty clay loam. In most places the color of the Ap horizon is 10YR 4/1, but in some places it is 10YR 4/2. The B horizon is clay or silty clay and is 45 to 60 percent clay. The color of the B21g horizon is generally 10YR 5/1 or 10YR 4/1, and that of the B22g horizon is 10YR 5/2 or 10YR 6/1. The Ap and B21g horizons are slightly acid to neutral. The B22g, B23g, and B24g horizons are ordinarily neutral, but they range from slightly acid to mildly alkaline. At a depth above 20 inches, the colors of the mottles are commonly 10YR 5/4, 4/3, and 4/4; below that depth, they are 10YR 5/8, 10YR 4/4, or 2.5Y 5/4. The depth to carbonates is about 40 inches in most places, but it ranges from 36 to 50 inches. In this county Latty soils commonly have a solum that formed in lacustrine material and a substratum that formed in clay till. Where the C horizon is lacustrine, glacial till is commonly within a foot of the top of the C horizon.

Latty soils differ from Toledo and Hoytville soils in not having a dark-colored surface layer. They are grayer and more poorly drained than the adjacent, somewhat poorly drained Nappanee soils.

Latty clay (0 to 3 percent slopes) (Lc).—Areas of this soil are commonly near areas of Nappanee soils that occur in positions where drainage is slightly better. They are adjacent to areas of St. Clair soils on streambanks and adjacent to areas of Hoytville soils. This soil has the profile described as representative of the series.

Included in mapping were a few areas where the surface layer is dark colored, particularly where this soil is adjacent to Hoytville soils.

Very poor natural drainage, a high content of clay in the surface layer, and slow to very slow permeability are the main limitations for both farm and nonfarm uses. Surface runoff is slow to ponded. The soil is slow to dry out in spring and is commonly cloddy because it has been worked when too wet. (Capability unit IIIw–5)

Latty silty clay loam (0 to 3 percent slopes) (Lo).—This soil is commonly near low-lying sandy ridges. In some places areas of this soil are near areas of Nappanee loam. The maintenance of tilth in this soil is not so severe a problem as it is in Latty clay, and crop response to management is much better.

Included in mapping were small areas where slopes are 3 to 6 percent. These areas occupy only a small acreage along intermittent drainageways where uplands adjoin the flood plains. Also included were a few areas of Latty clay and a few areas of Nappanee silty clay loam.

Very poor natural drainage and slow to very slow permeability are the main limitations for both farm and nonfarm uses. Surface runoff is slow to ponded. The soil is slow to dry out in spring, but if adequately drained, it is not difficult to farm. It is low in content of organic matter and is subject to crusting. (Capability unit IIIw–5)

McGary Series

The McGary series consists of nearly level, somewhat poorly drained soils that formed in clayey and silty sediments laid down in old glacial lakes. These soils occur as small, scattered areas on the glacial till plains.

In a representative profile, silt loam extends to a depth of 16 inches. The uppermost 12 inches, which includes the plow layer, is dark grayish brown, and the lower 4 inches is generally light brownish gray and is distinctly mottled with yellowish brown. Below this is a transitional layer of brown silty clay loam. At a depth of 21 inches is dark grayish-brown silty clay that has distinct, yellowish-brown mottles. At a depth below 45 inches are strata of old, limy, lake-laid sediments that range from clay to silt loam in texture.

Permeability is slow, and the available moisture capacity is medium to high. The water table is seasonally high. The root zone is deep when the water table is low in summer or where it has been lowered by artificial drainage. Reaction is medium acid to slightly acid in the upper part of the root zone and neutral in the lower part.

Soils of the McGary series are used mainly for corn and soybeans. If artificially drained, they dry out earlier in spring than they would otherwise. They tend to be soft and unstable when wet.

Representative profile of McGary silt loam in the SE¼ sec. 35, T. 3 S., R. 3 E. (York Township).

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A21—9 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, thick, platy structure; friable; neutral; diffuse, wavy boundary.

A22—12 to 16 inches, light brownish-gray (10YR 6/2) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/8); moderate, thick, platy structure; friable; medium acid; clear, wavy boundary.

B1tg—16 to 21 inches, brown (7.5YR 4/4) silty clay loam; many, medium, prominent mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/4); moderate, fine and medium, subangular blocky structure; friable; thin, discontinuous, grayish-brown (10YR 5/2) clay films on ped surfaces; slightly acid; clear, irregular boundary.

B21tg—21 to 33 inches, dark grayish-brown (10YR 4/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); strong, fine and medium, subangular blocky structure; firm; thin, continuous, gray (10YR 5/1) clay films on ped surfaces; neutral; diffuse, irregular boundary.

B22tg—33 to 45 inches, dark grayish-brown (10YR 4/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/4); strong, fine and medium, subangular blocky structure; firm; medium, continuous, gray (10YR 5/1) clay films on ped surfaces; neutral; clear, irregular boundary.

C—45 to 60 inches, grayish-brown (10YR 5/2), stratified silty clay and clay loam and very thin strata of silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; very firm; moderately alkaline (calcareous).

The A horizon is 10YR 4/2, 4/1, 5/1, or 6/1 in color, and unless limed, it is medium acid. The B1 horizon is silty clay loam or clay loam that ranges from medium acid to neutral, and the B2 horizon is silty clay or clay that is neutral in most places but ranges from slightly acid to mildly alkaline. The depth to carbonates is about 42 inches in most places, but it ranges from 34 to 60 inches. In some places the C horizon has small pockets or lenses of fine sand.

McGary soils are the somewhat poorly drained soils in a drainage sequence with the very poorly drained Montgomery soils. They are less poorly drained and have a lighter colored surface layer than Montgomery soils. They are smoother than the somewhat poorly drained Blount soils, and they have fewer coarse fragments throughout the profile.

McGary silt loam (1 to 3 percent slopes) (Mc).—This soil occurs as rather small, oval or irregularly shaped areas, commonly on the slight rises of local "lakebed" areas. Areas of this soil are commonly near or adjacent to areas of Blount and Montgomery soils, and a few areas are on terraces between areas of Blount soils and soils of the flood plains. Included in mapping were areas where the slope is 3 to 6 percent.

Somewhat poor natural drainage is the main limitation for both farm and nonfarm uses. Slow permeability is a limitation for some nonfarm uses. Surface runoff is slow. Unless drained, the soil is slow to dry out in spring. It generally has low organic-matter content and is subject to crusting in cultivated areas. Erosion is a hazard in the included gently sloping areas. (Capability unit IIIw–1)

Mermill Series

The Mermill series consists of nearly level, very poorly drained soils that formed partly in outwash and partly in clayey glacial till or old lake-laid sediments. These soils have a dark-colored surface layer less than 10 inches thick. They occur on or adjacent to stream terraces and beach ridges, and, locally, on outwash plains.

In a representative profile the plow layer is very dark gray silt loam about 9 inches thick. Below this, to a depth of 36 inches, is dark grayish-brown to grayish-brown clay loam that has distinct, yellowish-brown mottles. Below this is a contrasting layer that is generally more clayey and less pebbly and gritty than the layers above it. At a depth of 40 inches, this soil material is very dense, compact, and calcareous. The soil material at depths above 36 inches formed in outwash, but below this depth, it formed in weathered material from the uppermost 4 inches of the underlying glacial till or lacustrine sediments.

Permeability is moderate in the upper part of the profile and slow to very slow in the lower part. The available moisture capacity is medium. The water table is seasonally high, and the soil above the contrasting layer is seasonally saturated. In most places the root zone is moderately deep; it is limited by the depth to underlying till or lacustrine deposits. Reaction in the root zone is neutral.

Soils of the Mermill series are used mainly for corn, soybeans, tomatoes, and sugar beets. They are subject to seepage and are slow to dry out. Artificial drainage is beneficial to crops and increases farming efficiency.

Representative profile of Mermill silt loam in the SW¼ sec. 9, T. 2 S., R. 3 E. (Ridge Township).

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, fine and medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21tg—9 to 24 inches, dark grayish-brown (2.5Y 4/2) clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); weak, medium and coarse, subangular blocky structure; friable; thin, continuous clay films on ped surfaces; neutral; gradual, wavy boundary.

B22tg—24 to 36 inches, grayish-brown (2.5Y 5/2) clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6 to 5/8); weak, medium, subangular blocky structure; firm; thin, continuous clay films on vertical surfaces and thin, patchy clay films on horizontal surfaces; neutral; abrupt, smooth boundary.

IIB3tg—36 to 40 inches, grayish-brown (10YR 5/2) clay; many, coarse, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; very firm; neutral; gradual, wavy boundary.

IIC—40 to 60 inches, mottled grayish-brown (10YR 5/2), dark yellowish-brown (10YR 4/4), and yellowish-brown (10YR 5/6) clay; massive; very dense and compact; moderately alkaline (calcareous).

The color of the A horizon is 10YR 3/1, 10YR 2/1, or 10YR 2/2. The Ap horizon is slightly acid or neutral. The B2tg horizon is commonly loam, clay loam, or sandy clay loam in texture and, in places, has evident stratification. This horizon is slightly acid to neutral. The depth to the IIB3g horizon is 36 to 40 inches in most places, but it ranges from 20 to 40 inches. This horizon is clay or silty clay that is 3 to 8 inches thick and neutral to moderately alkaline in reaction. Where Mermill soils are on beach ridges and stream terraces, the coarse fraction generally contains variable quantities of fine gravel. Where they occur as "overwash" or "smears" on moraines and till plains, the coarse fraction is commonly made up only of sand.

The Mermill soils are the very poorly drained soils in a drainage sequence with the moderately well drained Rawson soils and the somewhat poorly drained Haskins soils. Mermill soils are similar to Millgrove soils, except that they have a contrasting layer at a depth within 40 inches.

Mermill silt loam (0 to 2 percent slopes) (Md).—This soil occurs mainly as long, narrow areas at the base of beach ridges, but it also occurs as irregularly shaped areas on some of the broader flats of the outwash plains. Areas of this soil are commonly adjacent to areas of Blount, Hoytville, Nappanee, Pewamo, and other soils of the beach ridges and outwash plains.

Included in mapping were areas where the surface layer is silty clay loam. Also included were areas of soils that have a contrasting layer at a depth of less than 20 inches, areas of soils that have a contrasting layer at a depth of more than 40 inches, and areas where the slopes are 2 to 6 percent.

Very poor natural drainage is the main limitation for both farm and nonfarm uses. Surface runoff is slow to ponded, and undrained areas are slow to dry out in spring. The included areas of silty clay loam are stickier and more difficult to till than are areas of silt loam. The included areas that have a contrasting layer at a depth of less than 20 inches are more droughty than those that have a similar layer at greater depth. (Capability unit IIw–5)

Millgrove Series

The Millgrove series consists of nearly level, very poorly drained, dark-colored soils that formed in outwash underlain by fine gravel and sand. The gravel and sand contain variable amounts of silt and clay. These soils are mainly along the base of beach ridges, but they are also on stream terraces.

In a representative profile the plow layer is very dark gray silt loam. The very dark gray color extends to a depth of 13 inches. Below the dark-colored layer are dark-brown and dark-gray layers of clay loam that have distinct mottles of very dark gray and strong brown. At a depth below 36 inches is dark-gray sandy clay loam that contains some pebbles. At a depth below 44 inches is strong-brown gravelly sandy loam that contains varying amounts of silt and clay.

The water table is seasonally high. Permeability is moderate. If adequately drained, these soils have a deep root zone and high available moisture capacity. Reaction within the root zone is neutral.

Most of the acreage has been cleared and artificially drained and is used for crops. Artificial drainage is needed if the soils are used for crops. Undrained areas are generally wooded.

Representative profile of Millgrove silt loam in the SE¼ sec. 9, T. 2 S., R. 3 E. (Ridge Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

A12—8 to 13 inches, very dark gray (10YR 3/1) loam; mottles of dark reddish brown (5YR 3/3) and yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; friable; common, medium, distinct, dark-brown (7.5YR 4/4) coatings; slightly acid; clear, wavy boundary.

B21tg—13 to 25 inches, dark-brown (7.5YR 4/2) clay loam; common, medium, distinct mottles of very dark gray (10YR 3/1); strong, medium, subangular blocky structure; firm; thin, continuous clay films on ped surfaces; few fine pebbles; neutral; clear, wavy boundary.

B22tg—25 to 36 inches, dark-gray (10YR 4/1) clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6) and dark brown (10YR 4/3); strong, medium and coarse, subangular blocky structure; very firm; thin, continuous clay films on ped surfaces; few fine pebbles; neutral; clear, wavy boundary.

B23tg—36 to 44 inches, dark-gray (10YR 4/1) sandy clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); weak, coarse, subangular blocky structure; very firm; thin, patchy clay films on vertical surfaces; few fine pebbles; neutral; clear, irregular boundary.

C—44 to 60 inches, strong-brown (7.5YR 5/6) fine gravelly sandy loam; common, medium, distinct mottles of dark gray (10YR 4/1); single grain; friable; moderately alkaline (calcareous); variable amounts of silt and clay.

The A horizon is silt loam or silty clay loam, has colors of 10YR 3/1, 10YR 2/1, or 10YR 2/2, and ranges from 10 to 16 inches in thickness. Reaction in the Ap horizon is medium acid to neutral. The B2tg horizon is clay loam, sandy clay loam, or in some places where there is evident stratification, loam.

It has a color of 10YR 4/1 or 10YR 4/2 and is slightly acid to neutral. The solum commonly ranges from 36 to 44 inches in thickness. On beach ridges and stream terraces, these soils commonly have fine gravel throughout the profile. Where they formed in local outwash on the till plains, they commonly do not have fine gravel above the C horizon. In some places the soil material grades to clean, stratified gravel and sand with increasing depth.

Millgrove soils are the very poorly drained soils in a drainage sequence with the well drained Belmore soils, the moderately well drained Haney soils, and the somewhat poorly drained Digby soils. Millgrove soils are much darker colored, grayer, and more mottled throughout the profile than any of the other soils in the drainage sequence. They contain more coarse sand and gravel throughout the profile than the very poorly drained Colwood soils. They differ from the very poorly drained Mermill soils in lacking a contrasting layer of finer textured soil material at a depth of 20 to 40 inches.

Millgrove silt loam (0 to 2 percent slopes) (Me).—This soil occurs mainly as rather long, narrow areas along the base of beach ridges and as irregularly shaped areas in some places on flats on the outwash plains. It has the profile described as representative of the series.

Included in mapping were areas of loam. Also included were a few areas of Mermill silt loam.

Very poor natural drainage is the main limitation for both farm and nonfarm uses. Surface runoff is slow to ponded. The organic-matter content is high, and the soil is easy to till. (Capability unit IIw–5)

Millgrove silty clay loam (0 to 2 percent slopes) (Mg).—This soil occurs mainly as irregularly shaped areas on stream terraces and outwash plains. Areas of this soil are mainly near areas of Mermill, Pewamo, and Blount soils. The profile of this soil is similar to the one described as representative of the series, except for the texture of the surface layer, which is more clayey. This soil is stickier and more difficult to work than Millgrove silt loam. Included in mapping were a few small areas of Mermill silty clay loam and Pewamo silty clay loam.

Very poor natural drainage is the main limitation both for farm and nonfarm uses. Surface runoff is slow to ponded. (Capability unit IIw–5)

Montgomery Series

The Montgomery series consists of very poorly drained, dark-colored soils that formed in clayey sediments laid down in old glacial lakes. These soils are on depressional flats on the till plains and outwash plains.

In a representative profile the plow layer is very dark gray silty clay. This dark-colored soil material extends below the plow layer to a depth of 12 inches. It is friable, largely because it has a high content of organic matter. Below this is dark-gray and gray, very firm and sticky silty clay that is distinctly mottled with dark brown and yellowish brown. At a depth below 54 inches is yellowish-brown, very firm, massive silty clay.

Surface runoff is slow to ponded, and permeability is slow to very slow. The water table is high in winter and spring because of the ponding of water and the slow to very slow permeability. The root zone is deep when the water table is low in summer or where it has been lowered by artificial drainage. Within the normal root zone, the available moisture capacity is high and reaction is neutral. If not drained, these soils are slow to dry out in spring.

Soils of the Montgomery series are used mainly for corn, soybeans, tomatoes, and other crops. Artificial drainage increases farming efficiency.

Representative profile of Montgomery silty clay in the SE¼ sec. 24, T. 3 S., R. 2 E. (Liberty Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay; few, fine, faint mottles of very dark grayish brown (10YR 3/2); weak, fine, granular structure; friable; high organic-matter content; neutral; abrupt, smooth boundary.

A12—8 to 12 inches, very dark gray (10YR 3/1) silty clay; weak, fine, subangular blocky structure; friable; few, fine, faint, very dark grayish-brown (10YR 3/2) ped coatings; neutral; clear, wavy boundary.

B21tg—12 to 24 inches, dark-gray (10YR 4/1) silty clay; many, fine and medium, distinct mottles of dark brown (10YR 4/3); strong, fine, subangular blocky structure; very firm; thin, patchy clay films; neutral; clear, smooth boundary.

B22tg—24 to 37 inches, gray (10YR 6/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); strong, medium and coarse, subangular blocky structure; very firm; medium, continuous clay films; neutral; diffuse, wavy boundary.

B23tg—37 to 54 inches, gray (10YR 6/1) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; very firm; medium, patchy clay films; mildly alkaline; abrupt, wavy boundary.

C—54 to 64 inches, yellowish-brown (10YR 5/4) silty clay and silty clay loam; many, medium, distinct mottles of gray (10YR 5/1); massive; very firm; moderately alkaline (calcareous).

The A horizon is silty clay or silty clay loam in texture and 10YR 2/1 or 10YR 3/1 in color. Color values of 3 or less extend to a depth of 10 to 15 inches. This horizon is slightly acid to neutral. The B2tg horizon is clay or silty clay in texture and dominantly 10YR or 5Y in hue. This horizon is neutral in most places, but it ranges from neutral to mildly alkaline. The depth to calcareous material is about 55 inches in most places, but it ranges from 40 to 65 inches.

The Montgomery soils in Van Wert County are outside the defined range for the series in that there is evidence of clay movement in the B horizon. This difference does not alter their usefulness and behavior.

Montgomery soils are the poorly drained soils in a drainage sequence with the somewhat poorly drained McGary soils. They are similar to Toledo and Pewamo soils in color and natural drainage. They have a thicker dark-colored surface layer than Toledo soils. They differ from Pewamo soils in having formed in clayey, lake-laid sediments instead of clay loam glacial till.

Montgomery silty clay (0 to 2 percent slopes) (Mn).—This soil occurs commonly as large, elongated areas that conform to the patterns of the natural drainageways. It occurs in nearly flat to depressional areas on the glacial till plains. Areas of this soil are generally near or adjacent to areas of Pewamo and Blount soils. This soil has the profile described as representative of the series.

Very poor natural drainage is the main limitation for both farm and nonfarm uses. This soil can be tilled only within a narrow range of moisture content. The clayey surface layer is hard to maintain in good tilth; it is cloddy if tilled when too wet. (Capability unit IIIw–5)

Montgomery silty clay loam (0 to 2 percent slopes) (Mm).—This soil occurs mainly in nearly level to depressional areas on the till plains, but it does not occur in deep depressions. Areas of this soil are commonly near or adjacent to areas of Pewamo and Blount soils. The profile of this soil is similar to the one described as representative of the series, but the surface layer contains less clay and more sand. Because this soil is less clayey than Montgomery silty clay, it is easier to till.

Included in mapping were small oval areas where the surface layer is silt loam. These areas are near the beach ridges and near areas of glacial outwash. Also included were a few small areas of light-colored Blount soils.

Very poor drainage is the main limitation for both farm and nonfarm uses. The soil is cloddy if it is worked when wet. (Capability unit IIIw-5)

Morley Series

The Morley series consists of gently sloping to moderately steep, moderately well drained soils that formed in compact, calcareous clay loam glacial till. These soils are on uplands on the glacial till plains south of U.S. Route 30.

In a representative profile the plow layer is dark grayish-brown silt loam about 8 inches thick. Beneath the plow layer, to a depth of 13 inches, is brown silty clay loam. In the next layer the soil material is clayey and brown to dark grayish brown. At a depth below 26 inches is grayish-brown clay loam glacial till. Yellowish-brown mottles occur at depths below 13 inches.

The available moisture capacity is medium. The water table is seasonally high for short periods in winter and spring. Permeability is slow; the dense underlying glacial till inhibits the movement of water and limits the growth of roots. The root zone is moderately deep. Reaction ranges from strongly acid in the upper part of the root zone to neutral in the lower part.

Soils of the Morley series are used for cultivated crops or pasture.

Representative profile of Morley silt loam in the NE¼ sec. 20, T. 3 S., R. 1 E. (Willshire Township).

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam, moderate, medium and coarse, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1t—8 to 13 inches, brown (10YR 5/3) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; thin, patchy clay films on vertical surfaces; medium acid; clear, wavy boundary.

B21t—13 to 18 inches, brown (10YR 5/3) silty clay; few, fine, faint mottles of yellowish brown (10YR 5/4) and grayish brown (10YR 5/2); moderate, medium and coarse, subangular blocky structure; firm; thin, continuous clay films on vertical surfaces; and thin, patchy films on horizontal surfaces; medium acid; diffuse, irregular boundary.

B22t—18 to 26 inches, dark grayish-brown (10YR 4/2) clay; few, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; very firm; thin, continuous clay films on ped surfaces; neutral; diffuse, irregular boundary.

C—26 to 60 inches, grayish-brown (10YR 5/2) clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6 or 5/8); massive; extremely firm and compact; mildly alkaline (calcareous).

The Ap horizon is silt loam or loam. The A horizon is 10YR 4/2 or 10YR 5/2 in most places, but it is 10YR 4/1 or 10YR 5/1 in some places. It is strongly acid to slightly acid. The B1t horizon is clay loam or silty clay, as much as 15 inches thick in places. It is commonly medium acid, but it ranges from strongly acid to neutral. The B21t horizon is clay or silty clay. It is medium acid to slightly acid in most places, but it is strongly acid in some places. The B22t horizon is slightly acid to neutral. The solum becomes thinner as the slope increases. The depth to carbonates is about 26 inches in most places, but it ranges from 18 to 28 inches. The content of pebbles in the C horizon and throughout the profile is commonly less than 5 percent, and not more than 15 percent. These pebbles consist of limestone fragments and a mixture of pebbles derived from igneous rock.

The Morley soils in this county have low-chroma mottles in the uppermost 20 inches of the Bt horizon. Although outside the defined range for the series, this difference does not alter their usefulness and behavior.

Morley soils are the moderately well drained soils in a drainage sequence with the somewhat poorly drained Blount soils and the very poorly drained Pewamo soils. They are less clayey throughout the profile than St. Clair soils, and they are not so thin over the clayey B2 horizon.

Morley loam, 2 to 6 percent slopes (MoB).—This soil occurs mainly as rather small, oval or irregularly shaped areas at the highest elevations on the Fort Wayne moraine, but it also occurs on outwash plains and stream terraces. Areas of this soil are near or adjacent to areas of Blount soils and, in some places, areas of Digby and Haney soils. This soil has a surface layer that is commonly less than 12 inches thick, but as much as 18 inches thick in places. The surface layer of this soil is much less susceptible to crusting than that of Morley silt loam.

Included in mapping were areas of a soil that has a surface layer of fine sandy loam. This soil occurs mainly as small areas, generally less than 5 acres in size, and it is gently sloping in most places. Also included were a few small areas of Rawson loam.

Surface runoff is medium to rapid, and erodibility is a major limitation for farming. Tilth is generally good. Slow permeability is the main limitation for many nonfarm uses. (Capability unit IIe-2)

Morley silt loam, 2 to 6 percent slopes (MrB).—This soil occurs mainly adjacent to streams and on the Fort Wayne moraine, but it also occurs on knolls in the western part of the county. Areas of this soil occur with areas of Blount and Pewamo soils in the western part of the county. This soil has the profile described as representative of the series.

Surface runoff is medium to rapid, and erodibility is the main limitation for farming. The surface layer commonly has a low content of organic matter, has poor physical condition, and is subject to crusting. Slow permeability is the main limitation for many nonfarm uses. (Capability unit IIe-2)

Morley silt loam, 2 to 6 percent slopes, moderately eroded (MrB2).—This soil is mainly on long slopes adjacent to stream valley walls and the south face of the Fort Wayne moraine. About half the original surface layer has been removed by erosion. Consequently, the plow layer is less desirable for seed germination than the plow layer of uneroded Morley soils.

Included in mapping were small, moderately eroded areas where the slope is 6 to 12 percent, and small areas of Blount silt loam, 2 to 6 percent slopes, on the flat parts of the landscape. The included Blount soil is wetter than the Morley soil.

Surface runoff is rapid, and severe erodibility is the main limitation for farming. The surface layer is thinner over clay and dries out more quickly than an uneroded surface layer. Slow permeability is the main limitation for many nonfarm uses. (Capability unit IIIe-2)

Morley silt loam, 6 to 12 percent slopes, moderately eroded (MrC2).—This soil commonly occurs as long, rather narrow areas on stream breaks and in morainic areas. Many of these areas lie in short escarpmentlike positions. About half the original surface layer has been removed by erosion, and consequently, this soil is more droughty than the less sloping, less eroded Morley soils.

Included in mapping were essentially uneroded areas that have not been cleared and are not cultivated, because of the shortness of the slopes. Also included were a few severely eroded areas.

Surface runoff is rapid, and severe erodibility is the main limitation for farming. Slope and slow permeability are limitations for many nonfarm uses. (Capability unit IIIe–2)

Morley silt loam, 12 to 18 percent slopes, moderately eroded (MrD2).—This soil occurs mainly as irregularly shaped areas on the Fort Wayne moraine. It also occurs as long, narrow areas along escarpmentlike stream breaks. On the Fort Wayne moraine, the slopes are variable in length, but on the stream breaks, they are long. About half the original surface layer has been lost through erosion. This soil is more droughty than other Morley soils because of the combination of erosion and very rapid runoff.

Included in mapping were small, moderately steep, severely eroded areas adjacent to stream bottoms. The slopes are generally short in these areas.

Very severe erodibility is the main limitation for farming. Slope and slow permeability are the main limitations for many nonfarm uses. (Capability unit IVe–1)

Nappanee Series

The Nappanee series consists of nearly level to gently sloping, somewhat poorly drained soils that are moderately deep to calcareous clay glacial till. These soils occupy slight rises on the lake plain.

In a representative profile the plow layer is dark grayish-brown silt loam about 9 inches thick. Beneath the plow layer is a layer of dark grayish-brown and grayish-brown very firm clay that is mottled with yellowish brown. At a depth below 19 inches is grayish-brown, extremely firm, compact, calcareous clay glacial till.

The water table is high in winter and spring. The movement of water through these soils is slow to very slow. The available moisture capacity is medium to low; it is low in places where this soil is shallow to compact till. The root zone is moderately deep. Reaction is medium acid in the upper part of the root zone and neutral in the lower part.

Soils of the Nappanee series are important farming soils. They are used mainly for corn and soybeans. Artificial drainage helps to reduce seasonal wetness and thus allows the soils to dry out earlier in spring.

Representative profile of Nappanee silt loam in the NE¼ sec. 33, T. 1 S., R. 4 E. (Jackson Township).

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral (limed); abrupt, smooth boundary.

B21t—9 to 15 inches, dark grayish-brown (10YR 4/2) clay; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; firm; thin, patchy clay films on horizontal ped surfaces; slightly acid; diffuse, wavy boundary.

B22t—15 to 19 inches, grayish-brown (10YR 5/2) clay; many, coarse, distinct mottles of dark yellowish brown (10YR 4/4) and light olive brown (2.5Y 5/4); moderate, medium, subangular blocky structure; very firm; thin, continuous clay films on vertical faces, and thin, patchy films on horizontal faces; neutral; abrupt, irregular boundary.

C—19 to 60 inches, grayish-brown (2.5Y 5/2) clay; many, medium, distinct mottles of dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4); massive; extremely firm and compact; moderately alkaline (calcareous).

The A horizon is silt loam, loam, or silty clay loam in texture. The Ap horizon is 10YR 4/2 or 10YR 5/2 in color and medium acid to neutral. The B1 horizon, where present, is generally thin. The B2t horizon is clay or silty clay and has a base color of 10YR 5/2, 10YR 4/2, or 2.5Y 5/2. This horizon is slightly acid to neutral. The depth to carbonates is commonly about 20 inches, but the depth to calcareous till ranges from 18 to 34 inches.

Nappanee soils are the somewhat poorly drained soils in a drainage sequence with the moderately well drained St. Clair soils and the very poorly drained Hoytville soils. There is a striking contrast between the light-colored Nappanee soils and the darker colored Hoytville soils in plowed areas where both of these soils occur. Nappanee soils are less clayey and better drained than Latty soils. They are thinner over a clayey B2 horizon than Blount soils.

Nappanee loam, 0 to 2 percent slopes (NaA).—This soil occurs mainly on slight rises of the lake plain. It has a loamy surface layer that is not more than 10 inches thick in most places. It has better surface tilth and is less susceptible to surface crusting than Nappanee silt loam.

Included in mapping were a few areas of Haskins loam, 0 to 2 percent slopes. The Haskins soil is thicker over till material than the Nappanee soil.

Surface runoff is slow, and seasonal wetness is the main limitation for farming. Slow to very slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIIw–1)

Nappanee silt loam, 0 to 2 percent slopes (NpA).—This soil occurs as oval areas, mainly on slight rises of the lake plain. Areas of this soil are commonly surrounded by large areas of Hoytville and Latty soils. This soil has the profile described as representative of the series.

Included in mapping were a few small areas of Nappanee silt loam, 2 to 6 percent slopes; Nappanee loam, 0 to 2 percent slopes; and Nappanee silty clay loam, 0 to 2 percent slopes.

Surface runoff is slow to ponded, and seasonal wetness is the main limitation for farming. The soil is susceptible to surface crusting because it is low in content of organic matter. Seasonal wetness and slow permeability are limitations for many nonfarm uses. (Capability unit IIIw–1)

Nappanee silt loam, 2 to 6 percent slopes (NpB).—This soil occurs as elongated areas, mainly adjacent to streams. In most places the slope is 2 to 4 percent. Areas of this soil occur next to areas of St. Clair, Hoytville, and Latty soils.

Included in mapping were a few small areas of St. Clair silt loam, 2 to 6 percent slopes; Nappanee silty clay loam, 2 to 6 percent slopes; and Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded.

Seasonal wetness is the main limitation for farming. Surface runoff is medium, and erosion is a hazard in cultivated areas. The content of organic matter is low, and the soil is subject to crusting. Seasonal wetness and slow to very slow permeability are limitations for many nonfarm uses. (Capability unit IIIw–3)

Nappanee silty clay loam, 0 to 2 percent slopes (NtA).—This soil occurs generally as oval or slightly elongated areas on slight rises of the lake plain. Areas of this soil are commonly surrounded by Hoytville or Latty soils. This soil dries out more slowly than other Nappanee soils.

Included in mapping were a few small areas of Nappanee silt loam, 0 to 2 percent slopes.

Surface runoff is slow to ponded, and seasonal wetness is the main limitation for farming. Tilth is generally poor, and the soil is cloddy if worked when wet. Slow to very slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIIw-1)

Nappanee silty clay loam, 2 to 6 percent slopes (NtB).—This soil occurs mainly as ribbon-shaped areas along the short valley walls of streams that dissect the lake plain. The slope in most places is near the lower limit of the range. The surface layer of this soil is sticky and more difficult to till than that of Nappanee loam or Nappanee silt loam.

Included in mapping were a few small, moderately eroded areas and a few small areas of Nappanee silt loam, 2 to 6 percent slopes, and of St. Clair silt loam, 2 to 6 percent slopes.

Surface runoff is medium to rapid, and seasonal wetness and erodibility are limitations for farming. The soil is cloddy if worked when wet. Slow to very slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIIw-3)

Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded (NtB2).—This soil is commonly adjacent to stream valleys that dissect the lake plain. The slopes are generally short and near the upper limit of the range. Typically, this soil is in fields between nearly level areas of the uplands and nearly level areas of the bottom lands. Areas of this soil are commonly adjacent to areas of Hoytville, Latty, St. Clair, and other Nappanee soils. They are also commonly adjacent to soils of the flood plains. This soil is more droughty and less well suited to crops than other Nappanee soils.

Included in mapping were areas of Hoytville, Latty, St. Clair, and other Nappanee soils. Also included were soils of the flood plains.

Seasonal wetness is the main limitation for farming. This soil is plowed and managed along with the adjacent nearly level areas because it has such short slopes that it would be difficult to manage separately. Good tilth is difficult to maintain. Surface runoff is rapid, and erosion is a continuing hazard in farmed areas. Slow to very slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIIw-3)

Pewamo Series

The Pewamo series consists of deep, nearly level to depressional, very poorly drained, dark-colored soils that formed in calcareous clay loam glacial till. They are on the glacial till plains south of U.S. Route 30.

In a representative profile the surface layer is very dark gray silty clay loam 12 inches thick. Below this are layers of mottled, dark-gray or gray, clayey material. At a depth below 54 inches is light-gray, compact, calcareous clay loam glacial till.

Surface runoff is slow in most places, but it is ponded in some places. Permeability is moderate in the uppermost 2 or 3 feet of the profile and moderately slow in the lower part. The water table is seasonally high for long periods, unless artificial drainage has been established. The available moisture capacity is high. The root zone is deep in summer; it is also deep in areas that are adequately drained. It is neutral in reaction.

If adequately drained, soils of the Pewamo series are well suited to farming. They are important farming soils and are used mainly for corn, soybeans, tomatoes, and sugar beets.

Representative profile of Pewamo silty clay loam in the NW¼ sec. 5, T. 3 S., R. 3 E. (York Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 12 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, subangular blocky structure; firm; few fragments of igneous rock and black shale; neutral; diffuse, wavy boundary.

B21tg—12 to 16 inches, dark-gray (10YR 4/1) silty clay; common, fine and medium, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; very firm; thin, patchy clay films along vertical faces; few fragments of igneous rock and black shale; neutral; gradual, wavy boundary.

B22tg—16 to 32 inches, gray (10YR 5/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); strong, fine and medium, subangular blocky structure; very firm; continuous, thin and medium clay films; few fragments of igneous rock and black shale; neutral; diffuse, wavy boundary.

B23tg—32 to 54 inches, gray (10YR 5/1) clay; many, fine and medium, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); strong, fine and medium, subangular blocky structure; very firm; thin, continuous clay films; few fragments of igneous rock and black shale; mildly alkaline; clear, irregular boundary.

C—54 to 70 inches, light-gray (10YR 6/1) clay loam; many medium and coarse mottles of yellowish brown (10YR 5/4) and brown (10YR 5/3); massive; very firm and compact; moderately alkaline (calcareous).

The A horizon ranges from 10 to 14 inches in thickness. It is silty clay loam or silty clay in texture and 10YR 3/1, 10YR 3/2, 10YR 2/2, or 10YR 2/1 in color. The B2 horizon is clay or silty clay. The A, B21tg, and B22tg horizons are slightly acid to neutral, and the B23tg horizon is slightly acid to mildly alkaline. Although generally less than 5 percent, the content of pebbles in the solum is variable. The depth to calcareous material is about 50 inches in most places, but it ranges from 30 to 60 inches.

Pewamo soils are the very poorly drained soils in a drainage sequence with the moderately well drained Morley soils and the somewhat poorly drained Blount soils. Pewamo soils have a thicker dark-colored surface layer than Hoytville or Toledo soils. They differ from Montgomery soils in that they formed in till material rather than in lacustrine material.

Pewamo silty clay loam (0 to 2 percent slopes) (Pm).—In some places this is the only soil and it occurs as broad areas, but in other places, areas of this soil are commonly interspersed with areas of Blount soils on the till plains. These areas of dark-colored and light-colored soils are readily visible in plowed fields. In most places the slope is only 1 percent. This soil has the profile described as representative of the series. It can be tilled throughout a wider range of moisture content than Pewamo silty clay. Included in mapping were small areas where the slope is more than 2 percent and small areas of the better drained Blount soils.

Very poor natural drainage is the main limitation for farming. If drained, this soil is one of the better farming soils, but where it occurs with Blount soils, the problems of drainage and management in general are complex. The content of organic matter is high, and the soil is resistant to

surface crusting. Seasonal wetness and moderately slow permeability are limitations for many nonfarm uses. (Capability unit IIw–6)

Pewamo silty clay (0 to 2 percent slopes) (Po).—This soil has a profile similar to the one described as typical of the series, but the surface layer is more clayey. It generally occupies more nearly level or depressional areas than Pewamo silty clay loam and is more susceptible to ponding.

Very poor natural drainage and a clayey plow layer are the main limitations for both farm and nonfarm uses. This soil can be tilled only within a narrow range of moisture content. It is cloddy if tilled when wet. A combination of surface drainage and tile is generally better than drainage with tile alone. (Capability unit IIw–6)

Quarry

Quarry (Qu) is a land type that occurs where open excavations have been made to remove limestone rock products for use in constructing roads and buildings and for industrial uses. The soil and other material overlying the limestone were removed first. These areas have no significant value for farming, but they have limited value as wildlife habitat and for recreation. (Not in a capability unit)

Rawson Series

The Rawson series consists of gently sloping, moderately well drained soils. These soils are on beach ridges, stream terraces, and outwash plains. The upper part of their profile formed in outwash, and the lower part in compact clay loam or clay glacial till or glacial lake sediments.

In a representative profile the surface layer is dark-brown loam about 10 inches thick. The next layer, to a depth of 18 inches, is brown loam. Below this are layers of dark-brown sandy clay loam and clay loam. At depths below 10 inches, the layers are faintly mottled and contain some rounded pebbles. At a depth of 31 inches is a contrasting clayey layer. The uppermost 4 or 5 inches of the underlying material is weathered, gray clay, and the rest is extremely firm, compact, calcareous glacial till.

Permeability is moderate in the upper part of the profile and slow to very slow in the lower part. The contrasting underlying material greatly limits the movement of water and the penetration of roots. The upper part of the profile is commonly saturated for short periods in winter and spring. The root zone is moderately deep in most places, and it has medium available moisture capacity. It is mainly strongly acid or medium acid in the upper part and slightly acid to neutral in the lower part.

Soils of the Rawson series are well suited to farming. They are commonly used as building sites because they are generally better drained than many of the adjacent soils.

Representative profile of Rawson loam in the SE¼ sec. 30, T. 3 S., R. 2 E. (Liberty Township).

Ap—0 to 8 inches, dark-brown (10YR 4/3) loam; moderate, fine, granular structure; very friable; medium acid; abrupt, smooth boundary.

A2—8 to 10 inches, dark-brown (7.5YR 4/4) loam; moderate, medium, granular structure; very friable; few fine pebbles; strongly acid; clear, wavy boundary.

B1t—10 to 18 inches, brown (7.5YR 5/4) loam; few, fine, faint mottles of strong brown (7.5YR 5/8); weak, fine, subangular blocky structure; friable; thin clay films in most pores; few fine pebbles; very strongly acid; clear, wavy boundary.

B21t—18 to 24 inches, dark-brown (7.5YR 4/4) sandy clay loam; few, fine, faint mottles of dark brown (7.5YR 4/3); weak, fine and very fine, subangular blocky structure; firm; thin, patchy clay films on ped surfaces; few fine pebbles; medium acid; diffuse, irregular boundary.

B22t—24 to 31 inches, dark-brown (7.5YR 4/4) clay loam; many, medium, distinct mottles of brown (7.5YR 5/2); weak, medium, subangular blocky structure; very firm; thin, patchy clay films on ped surfaces; few fine pebbles; slightly acid; abrupt, wavy boundary.

IIB3t—31 to 35 inches, gray (10YR 5/1) clay; many, medium, distinct mottles of yellowish brown (10YR 5/4 or 5/6); weak, medium, subangular blocky structure; firm, plastic; neutral; diffuse, irregular boundary.

IIC—35 to 60 inches, brown (10YR 5/3) heavy clay loam; common, medium, distinct mottles of dark grayish brown (10YR 4/2); massive; extremely firm and compact; moderately alkaline (calcareous).

The Ap horizon is 10YR 4/3, 10YR, 5/3, and 10YR 4/2 in color. The IIB horizon is clay or silty clay in texture. The depth to this horizon is commonly 30 to 36 inches, but it ranges from 24 to 42 inches. Where this soil is on beach ridges and stream terraces, the coarse material above the IIB horizon generally contains varying quantities of fine gravel and sand, but where the soil is on the moraine and on till plains, the fine gravel is commonly not present. Reaction in the A and B1t horizons ranges from very strongly acid to neutral, depending on liming practices.

Rawson soils are the moderately well drained soils in a drainage sequence with the somewhat poorly drained Haskins soils and the very poorly drained Mermill soils. Rawson soils differ from Haney soils in that they have finer contrasting material at a depth of less than 42 inches.

Rawson loam, 2 to 6 percent slopes (RmB).—This soil is mainly on stream terraces. It dries out readily and warms up earlier in spring than most other soils in the county. Areas of this soil are commonly adjacent to areas of Haney, Haskins, and Digby soils. Included in mapping were moderately eroded areas that have long slopes. The slope in these areas is near the upper limit of the range.

Erodibility is the main limitation for farming. Surface tilth is generally good. Slope and the slow to very slow permeability are limitations for some nonfarm uses. (Capability unit IIe–1)

St. Clair Series

The St. Clair series consists of gently sloping to sloping, moderately well drained soils that formed in weathered glacial till. These soils are shallow to moderately deep to compact glacial till. They occupy valley walls that are adjacent to drainageways.

In a representative profile the plow layer is grayish-brown silt loam about 7 inches thick. Below the plow layer are brown silty clay and yellowish-brown clay. At a depth of 16 inches is dark-brown, very compact, calcareous clay glacial till.

These soils are seasonally saturated with water for short periods, but they are commonly droughty late in summer. They have generally adequate drainage, except for a few seep spots. Permeability is very slow. The root zone is shallow to moderately deep, has medium to low available moisture capacity, and is medium acid to neutral. The total

amount of available moisture depends on the depth to compact till.

Soils of the St. Clair series are used mainly for corn, soybeans, and other field crops.

Representative profile of St. Clair silt loam in the SW1/4 sec. 9, T. 1 S., R. 4 E. (Jackson Township).

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

B21t—7 to 12 inches, brown (10YR 5/3) silty clay; weak, fine and medium, subangular blocky structure; firm; thin, patchy clay films; medium acid; gradual, wavy boundary.

B22t—12 to 16 inches, yellowish-brown (10YR 5/4) clay; few, fine, faint mottles of yellowish brown (10YR 5/6 or 5/8); moderate, medium, subangular blocky structure; thin, patchy clay films; very firm; slightly acid; diffuse, irregular boundary.

C—16 to 60 inches, dark-brown (10YR 4/3) clay; common, medium, distinct mottles of grayish brown (2.5Y 5/2); massive; very firm; moderately alkaline (calcareous).

The A horizon is 10YR 5/2, 10YR 5/3, or 10YR 4/2 in color. The Ap horizon ranges from strongly acid to slightly acid. The B2t horizon is medium acid to neutral. The depth to calcareous glacial till is 16 to 24 inches in most places, but the depth decreases and the horizons are thinner as the degree of slope increases.

St. Clair soils are the moderately well drained soils in a drainage sequence with the somewhat poorly drained Nappanee soils and the very poorly drained Hoytville soils. St. Clair soils are thinner over calcareous till than Morley soils, and they formed in till that is more clayey than the parent material of these soils.

St. Clair silt loam, 2 to 6 percent slopes (ScB).—Typically, this soil occurs as long, narrow areas near or adjacent to areas of Hoytville, Nappanee, and Latty soils and soils on first bottoms. This soil has the profile described as representative of the series. Included in mapping were small, moderately eroded areas. In these areas the slope is near the upper limit of the range.

Runoff is rapid, and erosion is a severe hazard in farmed areas. The control of erosion is a problem because the soil is generally farmed up and down the slope in fields that are made up largely of nearly level soils of both bottom lands and uplands. The content of organic matter is generally low, and tilth is poor. The soil is droughty in summer. Very slow permeability is a limitation for many nonfarm uses. (Capability unit IIIe–2)

St. Clair silt loam, 6 to 12 percent slopes, moderately eroded (ScC2).—This soil occurs as long, narrow areas on stream breaks between the uplands and the bottom lands. The present plow layer is a mixture of silt loam from the remaining surface layer and silty clay from the subsoil. This soil is among the more droughty soils of the county.

Included in mapping were areas of uneroded St. Clair silt loam, 6 to 12 percent slopes, commonly in woods or pasture. In these areas, the slope is generally near the lower limit of the range. Also included were small areas of moderately eroded soils where the slope is 12 to 18 percent and a few areas of Nappanee silt loam near the top of the slopes.

Areas of this soil are farmed along with adjacent soils because they are too narrow and have slopes that are too short to farm separately. Erosion is a very severe hazard in cultivated areas. The content of organic matter is low, and tilth is very poor. The slope and the very slow permeability are limitations for many nonfarm uses. (Capability unit IVe–2)

Shoals Series

The Shoals series consists of deep, nearly level, somewhat poorly drained soils on bottom lands, mainly along the St. Marys River and its tributaries. These soils formed in silty and loamy sediments derived from calcareous glacial till of the uplands. They are subject to flooding.

In a representative profile the plow layer is dark grayish-brown silt loam about 8 inches thick. Below this, to a depth of 24 inches, is friable silt loam that is dark grayish brown in the upper part and dark gray in the lower part. Below this, to a depth of 48 inches, is gray light silty clay loam.

These soils are slow to dry out in spring. The water table is generally high in winter and spring, which is the period when severe flooding usually occurs. Permeability is moderately slow, and the available moisture capacity is high. In summer, when the water table is low, the root zone is deep. Reaction is generally neutral.

Soils of the Shoals series are commonly farmed with adjacent soils on the flood plains. They are used for corn and soybeans. Some areas are wooded. Good drainage outlets are difficult to establish in some areas because of the low position of the soils relative to the streams.

Representative profile of Shoals silt loam in the NW1/4 sec. 34, T. 3 S., R. 1 E. (Willshire Township).

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; neutral; abrupt, smooth boundary.

B21g—8 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, faint mottles of dark gray (10YR 4/1); moderate, fine, subangular blocky structure; friable; neutral; gradual, wavy boundary.

B22g—14 to 24 inches, dark-gray (10YR 4/1) silt loam; many, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

C—24 to 48 inches, gray (10YR 5/1) light silty clay loam; many, medium, distinct mottles of dark brown (10YR 4/3); structureless; firm; neutral.

The Ap horizon is 10YR 4/2 or 10YR 5/3 in color, and it is slightly acid to neutral. The B horizon is silt loam, loam, silty clay loam, clay loam, or sandy loam in texture. Small pockets of sand and fine gravel commonly occur at depths below 30 inches.

Shoals soils are the somewhat poorly drained soils in a drainage sequence with the moderately well drained Eel soils and the very poorly drained Sloan soils. The Shoals soils are less clayey throughout the profile than the somewhat poorly drained Defiance soils.

Shoals silt loam (0 to 2 percent slopes) (Sh).—In some places, areas of this soil are between areas of Eel soils that are nearest the rivers or streams and areas of Sloan soils that are nearest the uplands or terraces. In other places, this is the only soil on the flood plains. After this soil has been flooded, it dries out more quickly than Sloan soils but less quickly than Eel soils.

Flooding and a seasonal high water table are limitations for both farm and nonfarm uses. The content of organic matter is generally low, and the soil is subject to crusting. (Capability unit IIw–2)

Sloan Series

The Sloan series consists of nearly level, very poorly drained, dark-colored soils that formed in recent alluvium washed from limy glacial till of the uplands. These soils are on low-lying bottom lands along the St. Marys River

and its tributaries. They commonly occupy old oxbows and abandoned stream channels. They flood easily because they are generally in the lowest areas of the flood plains.

In a representative profile the plow layer is very dark gray silty clay loam about 11 inches thick. Below this is gray silty clay loam that has distinct mottles of yellowish brown. At a depth below 36 inches are layers of silt, sand, and clay and lenses of fine gravel.

Surface runoff is slow to ponded, and permeability is moderately slow. The water table is high in winter and spring. Unless artificially drained, these soils are slow to dry out in spring. The root zone is deep in summer, when the water table is low. Within the root zone, the available moisture capacity is high and reaction is neutral.

If drained, soils of the Sloan series are suited to corn, soybeans, and other crops grown locally. They are less well suited to small grain because of the flood hazard and the seasonal wetness. Drainage outlets are generally difficult to establish because the soils are in low positions relative to the streams.

Representative profile of Sloan silty clay loam in the SW¼ sec. 29, T. 3 S., R. 1 E. (Willshire Township).

Ap—0 to 11 inches, very dark gray (10YR 3/1) silty clay loam; moderate, fine, granular structure; friable; neutral; clear, smooth boundary.

Bg—11 to 36 inches, gray (10YR 5/1) silty clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; dark-gray (10YR 4/1) organic coatings to a depth of 20 inches; neutral; diffuse, irregular boundary.

Cg—36 to 50 inches, gray (10YR 5/1), stratified alluvial deposits of silt, sand, and clay and small pockets and lenses of coarse sand and fine gravel; common, coarse, distinct mottles of yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6); structureless; friable; neutral.

The Ap horizon is 10YR 3/1 and 10YR 2/1 or, in a few places, 10YR 3/2 in color. It is slightly acid to neutral. The B horizon is silt loam, loam, silty clay loam, clay loam, or sandy loam. Small pockets of sand and fine gravel commonly occur at depths below 30 inches.

Sloan soils are the very poorly drained soils in a drainage sequence with the moderately well drained Eel soils and the somewhat poorly drained Shoals soils. Sloan soils are less clayey throughout than the very poorly drained Wabasha soils.

Sloan silty clay loam (0 to 2 percent slopes) (So).—This low-lying soil is subject to flooding, and it receives runoff water from adjacent soils. The flooding and a high water table in winter and spring are the main limitations for both farm and nonfarm uses. This soil is sticky when wet and cloddy if plowed or worked when wet. The content of organic matter in the surface layer is moderately high. (Capability unit IIIw-4)

Toledo Series

This series consists of nearly level, very poorly drained, dark-colored soils that formed in clayey and silty sediments that had been laid down in old glacial lakes. These soils are on the lake plain in relatively flat areas.

In a representative profile the plow layer is very dark gray silty clay about 8 inches thick. This layer has a high content of organic matter. Below this is dark-gray or gray, clayey soil material that has distinct, yellowish-brown and reddish-brown mottles. Below a depth of 42 inches are stratified, very firm, compact, silty and clayey materials.

Permeability is slow. The water table is seasonally high in winter and spring. The root zone is deep when the water table is low in summer or where it has been lowered by artificial drainage. Within the root zone the available moisture capacity is high and reaction is neutral.

Most areas of Toledo soils have been artificially drained and are used for corn, soybeans, sugar beets, and tomatoes. Artificial drainage helps to remove excess water and is beneficial to crops.

Representative profile of Toledo silty clay in the NE¼ sec. 5, T. 2 S., R. 2 E. (Pleasant Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay; moderate, medium, subangular blocky structure; friable; slightly acid; abrupt, smooth boundary.

B21g—8 to 14 inches, dark-gray (10YR 4/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, subangular blocky structure; very firm; neutral; gradual, smooth boundary.

B22g—14 to 22 inches, gray (10YR 5/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; very firm; neutral; gradual, wavy boundary.

B23g—22 to 42 inches, gray (10YR 6/1) silty clay; common, medium, prominent mottles of reddish brown (5YR 4/4) and yellowish brown (10YR 5/6 or 5/8); moderate, medium and coarse, prismatic structure breaking to moderate, medium, subangular blocky structure; very firm; neutral; clear, irregular boundary.

C—42 to 60 inches, light brownish-gray (10YR 6/2) silty clay; common, medium, distinct mottles of brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6); massive; very firm and compact; evident thin strata of clay and silt; moderately alkaline (calcareous).

The Ap horizon is commonly 10YR 3/1 in color, but it is 10YR 2/2, 10YR 2/1, or 10YR 3/2 in places. It is silty clay in most places, but it is silty clay loam in some places. This horizon is slightly acid to neutral. The depth to calcareous material is about 44 inches in most places, but it ranges from 36 to 50 inches. A neutral reaction is common throughout the solum.

Toledo soils have a thinner dark-colored A horizon than the very poorly drained Pewamo soils, and they formed in lacustrine material, rather than in glacial till. They differ from the very poorly drained Hoytville soils in having formed in lacustrine material, rather than in waterworked glacial till. Toledo soils have a thinner dark-colored A horizon than the very poorly drained Montgomery soils. They differ from the very poorly drained Latty soils in having a dark-colored A horizon.

Toledo silty clay (0 to 2 percent slopes) (To).—This soil generally occurs as elongated areas on the broad depressed flats of the lake plain and along interbeach ridge sloughs. Areas of this soil are generally next to or near Hoytville soils.

Included in mapping were a few areas that have a surface layer of silty clay loam because the soil has been mixed with sandier materials from the nearby beach ridges.

Very poor natural drainage and a seasonal high water table are the main limitations for farming, but most areas have been artificially drained. This soil can be tilled only within a narrow range of moisture content. It is cloddy if worked when wet. Slow permeability and seasonal wetness are limitations for many nonfarm uses. (Capability unit IIIw-5)

Wabasha Series

The Wabasha series consists of nearly level, very poorly drained, dark-colored soils that formed in alluvium. These soils occupy low areas on flood plains. Floodwaters generally stand on these soils longer than on other soils of the bottom lands.

In a representative profile the plow layer is very dark gray silty clay loam about 8 inches thick. Beneath the plow layer, the soil material is mostly dark-gray clay to a depth of about 36 inches. The next layer is brown clay that has dark-gray coatings. At a depth below 46 inches is gray, stratified clay, silty clay, and heavy silty clay loam.

Surface runoff is slow to ponded, permeability is slow, and the available moisture capacity is high. The water table is seasonally high for prolonged periods. In summer, when the water table is low, the root zone is deep. Reaction in the root zone is neutral in most places, but it increases to mildly alkaline at a depth below 36 inches.

Soils of the Wabasha series are of limited importance for farming in this county. They can be artificially drained, but in many areas good outlets are not available. Corn is the dominant crop.

Representative profile of Wabasha silty clay loam in the NW¼ sec. 13, T. 2 S., R. 4 E. (Washington Township).

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

B21g—8 to 20 inches, dark-gray (10YR 4/1) clay; common, fine and medium, distinct mottles of brown (10YR 4/3); moderate and strong, medium, subangular blocky structure; very firm; few very dark gray (10YR 3/1) coatings on vertical surfaces; neutral; diffuse, wavy boundary.

B22g—20 to 36 inches, dark-gray (10YR 4/1) clay; common, medium, distinct mottles of dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; very firm; neutral; gradual, wavy boundary.

B23g—36 to 46 inches, brown (10YR 4/3) clay; common, medium, distinct mottles of gray (10YR 5/1); weak, medium and coarse, subangular blocky structure; very firm; dark-gray (10YR 4/1) coatings; mildly alkaline; clear, wavy boundary.

Cg—46 to 60 inches, gray (10YR 5/1) stratified clay, silty clay, and heavy silty clay loam; many, medium and coarse, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); massive; very firm; mildly alkaline.

The A horizon is very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) in color. The Ap horizon is either silty clay loam or silty clay. In the uppermost 30 inches, the B2 horizon is dominantly dark gray to gray and has a hue of 10YR or 2.5Y. Among the mottle colors are yellowish brown (10YR 5/4 or 5/6), dark yellowish brown (10YR 4/4), dark brown (10YR 4/3), light olive brown (2.5Y 5/4), and grayish brown (10YR or 2.5Y 5/2). The Cg horizon is silty clay loam, silty clay, or clay in texture, but in places there are thin strata of loam or sandy loam. Reaction in the solum is neutral to a depth of 40 inches in most places, but it ranges from slightly acid to mildly alkaline.

Wabasha soils are similar to the somewhat poorly drained Defiance soils in texture, but they have a darker colored surface layer and are more poorly drained. They are more clayey throughout than the very poorly drained Sloan soils. Wabasha soils differ from Montgomery soils in lacking a Bt horizon.

Wabasha silty clay loam (0 to 2 percent slopes) (Wa).—This soil occupies slightly higher positions than Wabasha silty clay. Areas of this soil are generally adjacent to areas of Defiance, Montgomery, and Sloan soils. This soil has the profile described as representative of the series.

Included in mapping were a few areas of Wabasha silty clay and some areas of soil that has a dark-colored surface layer 10 to 15 inches thick.

Wetness and flooding are the main limitations for both farm and nonfarm uses. The early flooding limits the use of this soil to summer-grown crops. Surface tilth is generally good, but the soil is cloddy if worked when wet. (Capability unit IIIw-4)

Wabasha silty clay (0 to 2 percent slopes) (Wh).—This soil is in the lower positions on flood plains. It is mainly in backwater areas and in old, abandoned stream channels, but it also occurs on bottom lands along the sluggish streams that dissect the lake plain and the till plains. It does not occur along the St. Marys River and its tributaries. Areas of this soil are adjacent to areas of Defiance soils in most places, but they are adjacent to areas of Sloan and Montgomery soils in some places.

Included in mapping were soils, on the lake plain, that have a dark-colored surface layer 10 to 15 inches thick.

Flooding and wetness are the main limitations for both farm and nonfarm uses. Tilth of the surface layer is generally poor. The surface layer dries out so slowly that it is difficult to till. (Capability unit IIIw-4)

Wabasha Series, Moderately Shallow Variant

The Wabasha series, moderately shallow variant, consists of very poorly drained, dark-colored soils that are moderately shallow to limestone bedrock. These soils are on flood plains of the lake plain, mainly in the eastern part of the county. They are subject to flooding.

In a representative profile the plow layer is very dark grayish-brown silty clay loam about 9 inches thick. Below this, to a depth of 15 inches, is very dark grayish-brown silty clay. The next layer is dark-gray silty clay. At a depth of 30 inches is limestone bedrock.

Permeability is slow. The available moisture capacity is medium, but the soils are seldom droughty because of recharge from adjacent upland areas. The water table is seasonally high. The root zone is moderately deep where the water table has been lowered by artificial drainage. Reaction is neutral throughout the profile.

Soils of the Wabasha series, moderately shallow variant, are used for summer row crops.

Representative profile of Wabasha silty clay loam, moderately shallow variant, in the NW¼ sec. 11, T. 2 S., R. 4 E. (Washington Township).

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silty clay loam; strong, fine and medium, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B21g—9 to 15 inches, very dark grayish-brown (10YR 3/2) silty clay; few, fine, distinct mottles of yellowish brown (10YR 5/6 or 5/4); strong, medium, subangular blocky structure; very firm; neutral; clear, irregular boundary.

B22g—15 to 30 inches, dark-gray (10YR 4/1) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; very firm; few thin lenses of sandy material; neutral; diffuse, irregular boundary.

R—30 inches +, limestone bedrock.

The Ap horizon is very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2). It is silty clay loam in most places, but it is silty clay in some places. The depth to limestone bedrock ranges from 20 to 40 inches.

The moderately shallow variant of Wabasha soils differs from the typical Hoytville soils in having formed in alluvium underlain by limestone instead of in glacial till.

Wabasha silty clay loam, moderately shallow variant (0 to 2 percent slopes) (Wb).—This soil occurs on some of the flood plains along streams that dissect the lake plain in the eastern part of the county. Included in mapping were areas of soils that have a dark-colored surface layer 8 to 10 inches thick.

Flooding and wetness are the main limitations for both farm and nonfarm uses. The moderate shallowness to limestone bedrock severely restricts the installation of drain tile because it is difficult to obtain the necessary depth and grade. (Capability unit IIIw-4)

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of soil formation, and the classification of the soils. The classification of soils by higher categories is shown in table 9.

No laboratory data have been reported in this soil survey, but data that apply to major soils of this county have been published in the soil surveys of other counties in Ohio. Data for soils of the Colwood, Digby, Eel, Haney, Haskins, and Hoytville series appear in the published Soil Survey of Wood County, Ohio (*13*), and those for soils of the Belmore, Blount, Digby, Haskins, Hoytville, Kibbie, Millgrove, Montgomery, Morley, Pewamo, and Rawson series appear in the published Soil Survey of Allen County, Ohio (*12*). Unpublished data on mechanical analysis of Blount, Belmore, Haney, Hoytville, Latty, Montgomery, Nappanee, and Toledo soils are on file in Columbus at the Ohio State University, the State office of the Soil Conservation Service, and the Ohio Department of Natural Resources, Division of Lands and Soil.

TABLE 9.—*Soil series classsified by higher categories*

Series	Family	Subgroup	Order	Great soil group (1938 classification)
Belmore [1]	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Blount	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Colwood	Fine-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Defiance	Fine, illitic, nonacid, mesic	Aeric Fluvaquents	Entisols	Alluvial soils.
Digby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Eel	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts.	Inceptisols	Alluvial soils.
Elliott	Fine, illitic, mesic	Aquic Argiudolls	Mollisols	Brunizems.
Haney	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Hoytville	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Hoytville, moderately shallow variant.	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Kibbie	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Latty	Fine, illitic, nonacid, mesic	Typic Haplaquepts	Inceptisols	Humic Gley soils intergrading toward Low-Humic Gley soils.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Mermill	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Humic Gley soils.
Millgrove	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Montgomery [1]	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls (Argiaquolls).	Mollisols	Humic Gley soils.
Morley [1]	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Nappanee	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Pewamo	Fine, mixed, noncalcareous, mesic (illitic).	Typic Argiaquolls	Mollisols	Humic Gley soils.
Rawson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
St. Clair	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Shoals	Fine-loamy, mixed, nonacid, mesic.	Aeric Fluvaquents	Entisols	Alluvial soils.
Sloan	Fine-loamy, mixed, noncalcareous, mesic.	Fluvaquentic Haplaquolls	Mollisols	Alluvial soils.
Toledo	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Wabasha	Fine, illitic, nonacid, mesic	Mollic Fluvaquents	Entisols	Humic Gley soils.
Wabasha, moderately shallow variant.	Fine, illitic, nonacid, mesic	Fluvaquentic Haplaquolls	Mollisols	Humic Gley soils.

[1] In this county these soils are taxadjuncts to the series for which they are named:
Belmore soils have a darker colored Ap horizon than defined for the series and are classified as Mollic Hapludalfs;
Montgomery soils show evidence of clay movement in the B horizon and are classified as Typic Argiaquolls;
Morley soils have low-chroma mottles in the uppermost 20 inches of the Bt horizon and are classified as Aquic Hapludalfs.

Factors of Soil Formation

The factors that determine the kind of soil that forms at any given point are the composition of the parent material, the relief or lay of the land, the living organisms in and on the soil, the climate under which the soil material accumulated and weathered, and the length of time that the forces of soil development have acted on the soil material. The relative importance of each factor differs from place to place, and each modifies the effect of the other four. In some cases one factor may dominate in the formation of a soil.

Climate and vegetation are the active factors of soil formation. They alter the accumulated soil material and bring about the development of genetically related horizons. Relief, mainly by its influence on temperature and runoff, modifies the effect of climate and vegetation. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

The differences among soils in Van Wert County are chiefly the result of differences in parent material and relief. Climate and vegetation have strongly influenced the development of the soils, but these factors are nearly uniform throughout the county, and few differences in the soils can be attributed to them.

Parent material

The parent material in which the soils of this county formed is largely glacial in origin. It includes glacial till, alluvium, lacustrine sediments, beach ridge deposits, and outwash.

The bedrock is limestone, which is covered by 20 to 40 feet of glacial till in most places. Limestone is at a depth of only 6 to 8 feet in a few scattered areas and at a depth of as little as 2 or 3 feet in a few areas on the lake plain. Some of the streams in the northeastern part of the county flow on the limestone bedrock. Deep glacial deposits may occur where old deep-stage drainage valleys were formed.

A bank of low rolling hills that makes up part of the Fort Wayne terminal moraine (see fig. 6, p. 71) occurs mainly in the western part of Willshire Township but also in the extreme southern part of Jennings Township. Blount and Morley soils are the dominant soils that formed in the till of this moraine.

On the till plains south of U.S. Route 30, the parent material is moderately fine textured, calcareous till. This till commonly is 31 to 38 percent clay and 16 to 28 percent calcium carbonate. Blount, Morley, and Pewamo soils are the dominant soils that formed in this material.

Adjacent to the till plains are local areas of glacial outwash, stream terrace deposits, and alluvium along the major streams. The alluvium washed from the adjacent uplands. Eel, Shoals, and Sloan soils formed in loamy alluvium along the St. Marys River and its tributaries, and Wabasha and Defiance soils formed in clayey alluvium along other streams. There are also some rather extensive areas of fine-textured lacustrine sediments. The soils that formed in these sediments are mainly of the Toledo and Montgomery series.

On the lake plain north of U.S. Route 30, the parent material is mainly glacial till that has been reworked by lake water, but in some areas, it consists of lake sediments. The till is about 35 to 45 percent clay and about 15 to 25 percent calcium carbonate. Hoytville and Nappanee soils are the dominant soils that formed in these materials. In the extreme northeastern part of Union Township and in the northern part of Hoaglin and Jackson Townships, the glacial deposits have been more extensively modified by the lake water. Latty soils formed in these clayey sediments. The moderately shallow variant of Hoytville soils and the moderately shallow variant of Wabasha soils formed on the lake plain in areas where the soil material is only 2 or 3 feet thick over limestone.

The soils that formed on the prominent beach ridges and in the nearby outwash areas are generally very sandy and gravelly. These ridges occur as bands paralleling U.S. Route 30. Belmore, Haney, and Digby soils are representative of the soils that formed on these ridges. Rawson and Haskins soils formed where the beach ridge deposits are relatively thin, and in these soils, finer textured till or lacustrine material occurs at a depth of less than 42 inches.

Relief

Relief has affected the formation of soils in this county, chiefly through its effect on the action of water both on and in the soil. Consequently, it has affected runoff, erosion, depth to the water table, internal drainage, and leaching. It also affects the amount of water that passes through the soil, and this amount of water largely determines the degree of profile development in a given parent material, within a given time, and under a given type of vegetation.

In general, relief in this county ranges from nearly level in most areas of the lake plain and on parts of the till plains to undulating in the morainic areas. There are strongly sloping areas on the moraine and on the valley walls along streams. The moderately well drained Morley and St. Clair soils occur in these areas.

In the more strongly sloping areas, water runs off rapidly and removes the surface soil so that a deep soil cannot form. In nearly level to depressional areas, the soils remain wet for long periods of time, thus favoring the accumulation of organic matter. Pewamo and Millgrove soils, which have a high content of organic matter, partly as a result of their nearly level to depressional topographic position, formed in these areas. Water runs off slowly on many soils of the county.

Living organisms

Plants, insects, burrowing animals, micro-organisms, fungi, and other living organisms are active in the soil-forming process.

The original vegetation under which the soils of Van Wert County formed was principally deciduous forest. In the more poorly drained and very poorly drained areas of the lake plain and the till plains, a deciduous swamp forest prevailed. The common trees were probably black ash, white ash, American elm, shagbark hickory, basswood, swamp white oak, pin oak, sycamore, silver maple, and cottonwood. Scattered throughout this forest were a few openings where sedges and grasses grew. In the better drained, more sloping areas, the deciduous forest was of a somewhat different kind. Among the trees that were

probably dominant in the original stand are beech, basswood, white oak, red oak, and sugar maple.

The activity of animals seems to be of less importance in soil formation in this county than the growth of plants, and less is known about how they specifically affect soil formation. Insects and burrowing animals help to mix the soil materials from various horizons and bring some fresh material to the surface. When they die, they contribute organic material to the soils. In some soils there are vast numbers of micro-organisms and fungi that also affect soil formation. Man, too, exerts an influence on the process of soil formation by clearing the native forest and planting crops, by lowering the water table in naturally wet soils, by adding lime and fertilizer that change the soil chemistry, and by cultivating, excavating, and otherwise disturbing the upper layers of soil.

Climate

Climate is an active factor in soil formation. It affects the rate of plant growth, the amount of water available to plants, the removal of material by leaching, and the temperature of the soils. The degree of profile development depends largely upon the amount of water that moves downward through the soil.

This county has a temperate, humid, continental climate that has probably persisted over a long period of time. During this period, the climate has been relatively uniform throughout the county and probably does not account for major differences among the soils.

Time

Time is required for the formation of horizons in a soil. The length of time depends upon the combined action of the other soil-forming factors, particularly relief and parent material. More time is necessary for the formation of soil in some kinds of parent material than in others.

All of the county was covered by ice in the Wisconsin glaciation, and the soils have formed since this glacier retreated. The interval between the retreat of the ice and the present time is believed to be short enough that time would not be a major factor in accounting for differences among soils in this county. The soils are believed to have begun forming about 13,000 years ago on the lake plain and 15,000 years ago on the till plains.

Compared with soils in areas where earlier glaciation has taken place, or with those in unglaciated areas, the soils in Van Wert County have been developing a relatively short time. This short period of time accounts, in part, for the shallowness of leaching in some of the soils. For example, the carbonates have been leached to a depth of only 20 inches in Nappanee soils on the lake plain and to a depth of only 26 inches in Morley soils on the till plains.

Processes of Soil Formation

The soils of Van Wert County have horizons that developed through one or more of the following soil-forming processes: addition, loss, transfer, and transformation. Some of these processes promote differences within a soil; others retard or preclude differences.

Addition occurs as organic matter accumulates in the surface layer, as bases are received from organic matter and from ground water, as eroded material is deposited, and as bases are received from lime and fertilizer. To some degree in all the soils, plant nutrients move in a cycle from soil to plants and then back again to the soil in the form of litter or other organic matter. All the soils have had at least a thin layer of organic matter, but in most places, this layer has been largely destroyed through cultivation. The dark-colored surface layer in Pewamo, Hoytville, and other soils is evidence that the organic-matter content is high. Mermill, Millgrove, Pewamo, and Toledo soils are seasonally saturated, and they continually receive bases from ground water. Generally, they receive more bases than they lose. Wabasha, Shoals, and Sloan soils periodically receive eroded material deposited by floodwaters. Applications of lime and fertilizer to cultivated soils counteract, or may even exceed, the normal loss of plant nutrients and lime.

Loss occurs when bases are removed by leaching, when plant nutrients are removed by crops, and when soil material is removed through erosion. Carbonates have been removed to a depth of 20 to 35 inches in Morley, Blount, Nappanee, and most other soils of the uplands. This is one of the most significant losses in the county. It is a considerable quantity because the original soil material was 15 to 30 percent carbonates. The removal is slower if the soil material has a higher content of carbonates. Other minerals are lost through leaching, but at a slower rate than carbonates. In Pewamo, Millgrove, and other soils, a recurrent high water table causes the reduction of iron oxides and later loss by leaching. As a result, these soils have gray colors. Mottling, which occurs in all except the well-drained soils, is a result of the reduction and resegregation of iron oxides.

A significant transfer is that of colloidal matter from the surface layer to the lower layers. Fine clay is deposited in the cracks and root channels on the soil surface as a result of seasonal drying or precipitation. Suspended in percolating water, it then moves downward into the subsoil. Clay films or coatings of fine clay have formed in Blount, Morley, and other soils. Transfer of various sesquioxides from the surface layer to the lower layers also takes place in most of the soils.

Transformation of such primary minerals as feldspar and biotite into silicate clay minerals takes place within the zone of weathering. This is more important than other transformations that take place in this county. Two of the most common clay minerals in the county are illite and vermiculite. The transformation of some minerals produces free iron oxides.

Classification of the Soils

Two system of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and later revised (*9*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 and September 1968 (*11*). This system is under continual study, and readers interested in the development of the system should refer to the latest literature available.

The current system of classification defines classes in terms of observable or measurable properties of soils (*8*). It has six categories. Beginning with the most inclusive,

the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The placement of some soil series, particularly in families, may change as more precise information becomes available. Some soils in this county do not fit a series that has been recognized, but recognizing a separate series for them could not serve a useful purpose. These soils have been placed in a series that they strongly resemble and from which they differ only in ways that do not significantly affect their usefulness or behavior. They are called taxadjuncts to the series for which they are named.

Table 9 shows the classification of the soil series of Van Wert County according to the current system and the great soil group according to the 1938 system. Following are brief descriptions of the six categories.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system; Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Four of the ten soil orders occur in Van Wert County: Entisols, Inceptisols, Mollisols, and Alfisols.

Entisols are recent soils in which there has been little, if any, horizon development. This order is represented by soils of the Defiance, Shoals, and Wabasha series.

Inceptisols occur mostly on young, but not recent, land surfaces. This order is represented by soils of the Eel, Latty, and Toledo series.

Mollisols have a thick, dark-colored surface layer, moderate to strong structure, and base saturation of more than 50 percent. This order is represented by soils of the Colwood, Elliott, Millgrove, Montgomery, Pewamo, and Sloan series, and the moderately shallow variant of the Wabasha series.

Alfisols contain accumulated aluminum and iron, have argillic or natric horizons, and have a base saturation of more than 35 percent. This order is represented by soils of the Belmore, Blount, Digby, Haney, Haskins, Hoytville, Kibbie, McGary, Mermill, Morley, Nappanee, Rawson, and St. Clair series, and the moderately shallow variant of the Hoytville series.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the orders. The criteria for suborders reflect either the presence or absence of waterlogging, or soil differences resulting from climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups on the basis of uniformity in kind and sequence of genetic horizons. The great group is not shown in table 9, because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group, and other groups, called intergrades, that have properties of one great group but also one or more properties of another great group.

FAMILY.—Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

Additional Facts About the County

Van Wert County is in the northwestern part of Ohio, adjacent to the Indiana State line. It was organized in 1835. The beach ridges in this county were used for the principal Indian trails and later for one of the arterial wagon routes to the Great Plains. At first, farming developed slowly because methods had to be devised for draining the extensive areas of wet, level soils, particularly in the area north of U.S. Route 30. This area was a part of the "Black Swamp" of northwestern Ohio. After the late 1800's, however, when the installation of drainage ditches and tile drains was begun, farming developed rapidly. The clearing and draining of the soils have continued for many years, even to the present time in many of the remaining woodland areas. The drained areas are used for crops, and a large part of the acreage in the county is under cultivation.

Although the county is mainly agricultural, the gross income from industry nearly matches that from farming. More than 20 medium- to small-size factories provide employment for about 4,000 workers. Several new industries have located in the two industrial parks that are under development in the city of Van Wert, which is the county seat and largest town.

Transportation is provided by a network of all-weather County, State, and Federal highways; by several railroads that provide freight-shipping facilities; and by a hard-surfaced, night-lighted airport that provides chartered air service.

Climate [3]

The climate of Van Wert County is continental. This county, which is in the interior of the continent, west of the Appalachian Mountains, does not have differences in elevation sufficient to have a noticeable effect on climate. Elevations range from 720 feet in the extreme northeastern corner to about 960 feet in the southwestern part. There are no large bodies of water near enough to have a moderating effect on temperature. Lake Erie does not affect the temperature in this county; it affects temperature only in a 10- to 20-mile-wide strip along its shore, when the wind is blowing from a northerly direction.

The temperature varies widely from season to season, and the amounts of precipitation in spring and summer are larger than those at other times of the year. Below-zero temperatures can be expected about four times a winter, as polar air sweeps down from Canada. Temperatures above 90° F. are common in summer. The annual precipitation is about 36 inches. At any given place, about 42 thunderstorms can be expected each year. Tornadoes are rare. When they do touch down, most of them are poorly developed, in comparison with those in States farther west.

[3] By L. T. PIERCE, climatologist for Ohio, National Weather Service, United States Department of Commerce.

In a normal year, there are 82 clear days, 101 partly cloudy days, and 182 cloudy days. Cloudiness is greatest in winter and least in summer.

Temperature and precipitation data based on records from the Weather Service Station at Van Wert are shown in table 10. These data are representative of the county. The probabilities of low temperatures in spring and fall are shown in table 11.

During the cold season, the moisture content of the soil is gradually replenished because the amount of moisture received as precipitation is greater than the amount lost through evaporation. By the end of March, not only is the moisture content at or above field capacity, but groundwater reserves have also been built up. From then on through the growing season, the level of soil moisture depends on the balance between the amount of moisture received as rainfall and that lost through evaporation and transpiration. In April and May small grains, meadows, and pastures need rapidly increasing amounts of water, and if rainfall is seriously deficient, the available moisture may be depleted by the end of June. In July and August the moisture needs of summer row crops reach a maximum, and there is progressive drying of all soils because rainfall is almost always insufficient to meet the moisture needs. By the end of the growing season, the soil moisture available to plants is at a minimum.

The temperature of the uppermost few inches of the soil is about the same as that of the air. In general, the

TABLE 10.—*Temperature and precipitation data*

[All data from Van Wert, elevation 795 feet]

Month	Temperature					Precipitation					
	Average daily maximum [1]	Average daily minimum [1]	Mean [1]	Two years in 10 will have at least 4 days with [2]— Maximum temperature equal to or higher than—	Two years in 10 will have at least 4 days with [2]— Minimum temperature equal to or lower than—	Average total	One year in 10 will have [3]— Less than—	One year in 10 will have [3]— More than—	Average snowfall [4]	Number of days with measurable snowfall [2]	Average depth of snow on days with snow cover [2]
	°F.	°F.	°F.	°F.	°F.	In.	In.	In.	In.		In.
January	36.6	20.4	28.5	50.8	1.4	2.56	0.60	5.10	6.4	13.7	2.0
February	38.6	21.2	29.9	53.4	2.7	2.04	.70	3.25	4.8	11.7	1.7
March	48.3	27.8	38.0	68.3	13.8	3.25	1.10	5.40	3.8	4.6	2.3
April	62.0	37.9	49.9	78.8	26.0	3.59	1.55	6.40	1.3	.4	2.3
May	73.4	48.4	60.9	85.4	35.7	4.06	1.45	5.80	(5)	0	0
June	82.9	58.6	70.7	91.7	46.3	4.33	1.70	6.65	--------	0	0
July	87.0	62.0	74.5	93.2	51.3	3.53	1.75	6.10	--------	0	0
August	85.3	60.4	72.8	92.7	49.1	2.51	1.20	3.95	--------	0	0
September	78.7	53.4	66.0	91.5	39.2	2.95	1.40	4.95	--------	0	0
October	66.9	42.8	54.8	83.3	29.9	2.83	.45	5.65	(5)	0	(5)
November	50.1	32.2	41.1	68.0	18.5	2.51	1.15	5.00	2.8	1.4	3
December	38.4	23.1	30.7	57.1	1.6	2.15	.50	3.65	6.2	12.3	2.4
Year	62.4	40.7	51.5	------------	------------	36.31	29.65	43.35	25.3	----------	----------

[1] Based on records for the period 1931 to 1960.
[2] Based on records for the period 1945 to 1964.
[3] Based on records for the period 1925 to 1960.
[4] Based on records for the period 1932 to 1964.
[5] Trace.

TABLE 11.—*Probability of low temperatures in spring and in fall*

Probability	Dates for given probability and temperature					
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:						
1 year in 10 later than	March 30	April 10	April 23	May 8	May 18	June 4
2 years in 10 later than	March 25	April 4	April 17	May 3	May 12	May 29
5 years in 10 later than	March 14	March 25	April 7	April 23	May 3	May 19
Fall:						
1 year in 10 earlier than	November 13	November 1	October 20	October 7	September 24	September 12
2 years in 10 earlier than	November 18	November 6	October 25	October 12	September 29	September 17
5 years in 10 earlier than	November 28	November 16	November 5	October 22	October 9	September 27

soil temperature does not fall much below the freezing point, unless the ground is bare during the coldest winter weather. For this reason, frost does not ordinarily penetrate to a depth of more than 10 to 15 inches. During periods of mild weather, the air temperature rises rapidly enough to thaw the soil completely within 10 days to 2 weeks, even if the ground is frozen to a depth of 2 feet. This close relationship between air temperature and soil temperature is important in that the soils warm up rapidly in spring. Consequently, spring planting does not have to be delayed because of cold soil, unless the coldness is prolonged because of excess water.

Relative humidity fluctuates daily and falls as the air temperature rises. The average monthly high in the morning is about 85 percent, both in summer and winter, and the average low in the afternoon is nearly 65 percent in winter and in the middle or high forties in summer. On hot, fair days the relative humidity may fall as low as 20 percent.

The strongest winds occur in February and March and average 12.5 miles an hour. The lightest winds occur in August and average 7.4 miles an hour. The prevailing winds throughout the year are south-southwesterly and average 10.5 miles per hour.

Geology

The present landforms in the county are mainly the result of glaciation during the Pleistocene epoch. This glaciation occurred in late Wisconsin times, probably during the Cary substage, and was apparently the last to deposit glacial materials in this county. Recent discoveries indicate that the till was deposited mainly by advancing ice. Radiocarbon dating of material from the northern part of Ohio and Indiana indicates that the last glacier receded from this area about 15,000 years ago (*4*).

One area of the Fort Wayne moraine, which is the only moraine in the county, extends across the southeastern corner of Liberty Township in a northwest-southeast direction through Willshire Township and across the southwestern corner of Harrison Township. Another small area in the southernmost part of Jennings Township is occupied by the north face of this moraine (*6*). Areas of this moraine have stronger slopes than the areas of glacial till to the north and east.

Nearly level to gently sloping areas of ground moraine extend northward from the north face of the Fort Wayne moraine and terminate at the beach ridges of glacial Lake Maumee. The beach ridges (fig. 5) generally extend across the center of the county from Delphos to Van Wert, and from there in a northwesterly direction to the northwest corner of the county. U.S. Route 30 is on these ridges.

The lake plain, which is north of the beach ridges, was once covered or partly covered by two glacial lakes, Lake Maumee and Lake Whittlesey. The water level probably dropped nearly to the level of present Lake Erie about 8,000 or 9,000 years ago (*5*). The lake-laid sediments are underlain by glacial till that has been reworked to varying degrees, and there is a general, consistent increase in clay content of the till with increasing distance toward Paulding Basin. In the northeastern part of the county, there are 2 or 3 feet of clean, lake-laid deposits of clay and silt over the glacial till. The lake plain was part of an extensive swamp that was drained and cleared of forest in the late 1800's.

***Figure 5.*—Farm on one of the beach ridges formed by glacial Lake Maumee. Among the soils commonly on these ridges are those of the Belmore, Haney, and Digby series.**

The bedrock underlying the glacial till is limestone of the Monroe Formation in all the county except the southwestern part, where it is Niagara limestone. The limestone is near the surface in several places in the county, and it is exposed only in the streambeds. In most places where it is near the surface, the limestone has been quarried commercially. It is within 20 to 40 inches of the surface in the moderately shallow variants of the Hoytville and Wabasha series.

Relief and Drainage

This county is entirely within the watershed of Lake Erie. In most of the county, water drains toward the northeast into the Auglaize River and its sluggish, low-gradient tributaries. In the southwestern part of the county, it drains into the St. Marys River, which eventually flows into the Maumee River. All of the streams are subject to flooding, partly because of the inadequate size and the low gradient of their channels and partly because accumulated trash restricts the volume of water that can flow through the channel.

The physiography of the county can be classified into three broad general categories (fig. 6): the nearly level lake plain, the nearly level to gently sloping glacial till plains, and the gently sloping to steep morainic areas. The lake plain, which occupies mainly the area north of U.S. Route 30, makes up about 40 percent of the county. The glacial till plains, which are mainly south of U.S. Route 30 and north of the Fort Wayne terminal moraine, make up about 50 percent of the county. The morainic areas, which are in the southwestern and extreme southeastern parts, make up about 10 percent of the county.

The nearly level lake plain was once occupied by glacial lake Maumee. This plain is broad and flat. Its remarkable uniformity is broken in places by small, sluggish streams and a few low, sandy ridges. Surface runoff is very slow. The soils are mainly the dark-colored, very poorly drained soils of the Hoytville, Millgrove, and Mermill series.

The nearly level to gently sloping glacial till plains generally have better surface drainage than the lake plain.

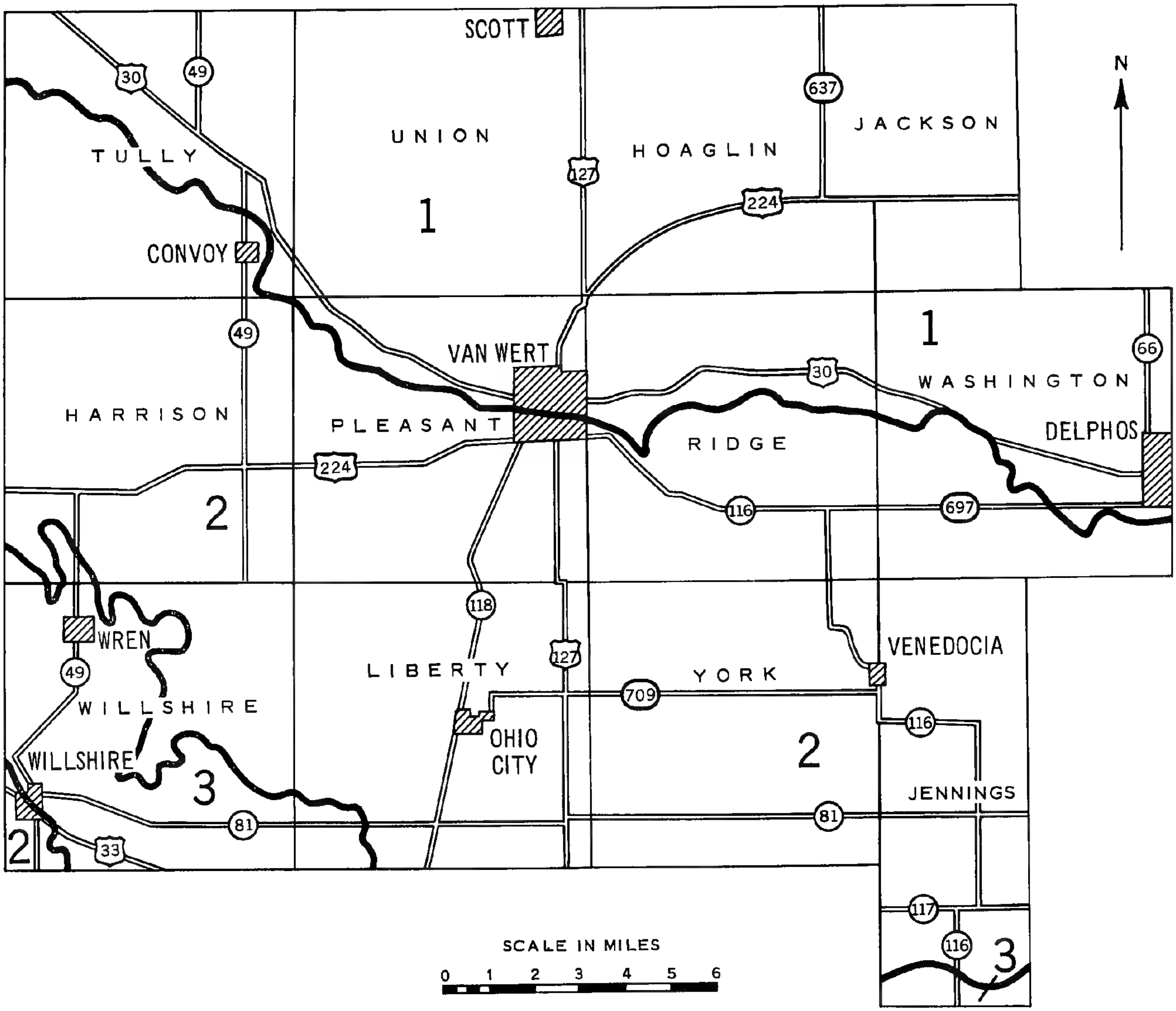

Figure 6.—Map of Van Wert County that shows the extent of topographic features. The area numbered 1 is a nearly level lake plain; the areas numbered 2 are nearly level to gently sloping glacial till plains; and the areas numbered 3 are part of a gently sloping to steep moraine.

About half the soils in this area are those of the Pewamo series and other dark-colored soils. The rest are light-colored soils of the Morley, Blount, and other series.

The dominant features in the morainic areas are the Fort Wayne terminal moraine and the St. Marys River and its tributaries. These areas are more strongly sloping than other parts of the county, and erosion is a serious hazard. Among the dominant soils are Morley and Blount soils.

Elevations range from slightly less than 720 feet above sea level on the lake plain in the northeastern part of the county to slightly more than 960 feet on the Fort Wayne terminal moraine in the southern part of the county.

Farming

The total acreage of this county, which is classified as rural, is 261,760 acres. According to the 1964 U.S. Census of Agriculture, 243,562 acres are in farms. For more than a decade, the number of farms has been decreasing and the size of the average farm has been increasing. Many farms have been combined with other farms to form larger units. In 1964 the farms numbered 1,313; an average farm was 185.5 acres in size. The general trend has been toward a decrease in general farming and raising of livestock and an increase in production of cash-grain crops. Farms that have many acres of cash-grain crops can generally be operated by only one or two men, because heavy power equipment can be used on nearly all the soils. There are many part-time farmers who are either employed in industry or have other nonfarm sources of income.

Since 1959 the number of acres in cropland, permanent pasture, and woodland has decreased. The acreage of corn, soybeans, and wheat has increased, but the acreage of oats has decreased. Except for chickens, the number of livestock has decreased. Many farms have no livestock. In 1964 the number of livestock on farms in the county was as follows:

Kind of livestock:	*Number*
Cattle and calves	10,099
Hogs and pigs	19,125
Sheep and lambs	4,700
Chickens	148,310
Turkeys	37,088

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Glossary

Acidity. See Reaction, soil.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonym: clay coating.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage sequence. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geologic agents.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Leached soil. A soil from which most of the soluble materials have been removed or in which these have been moved from one part of the profile to another.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows:

Abundance—*few*, *common*, and *many;* size—*fine*, *medium*, and *coarse;* and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural drainage. Drainage that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A horizon and the upper part of the B horizon and have mottling in the lower part of the B horizon and in the C horizon.

Somewhat poorly drained soils are wet for significant periods but not all the time. If Podzolic, they commonly have mottling below 6 to 16 inches, in the lower part of the A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, but some have few or no mottles.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Parent material (soil). The distintegrated and partly weathered rock from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables a soil horizon to transmit water or air. Terms used to described permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Root zone. The part of the soil that is penetrated, or can be penetrated, by plant roots.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particules, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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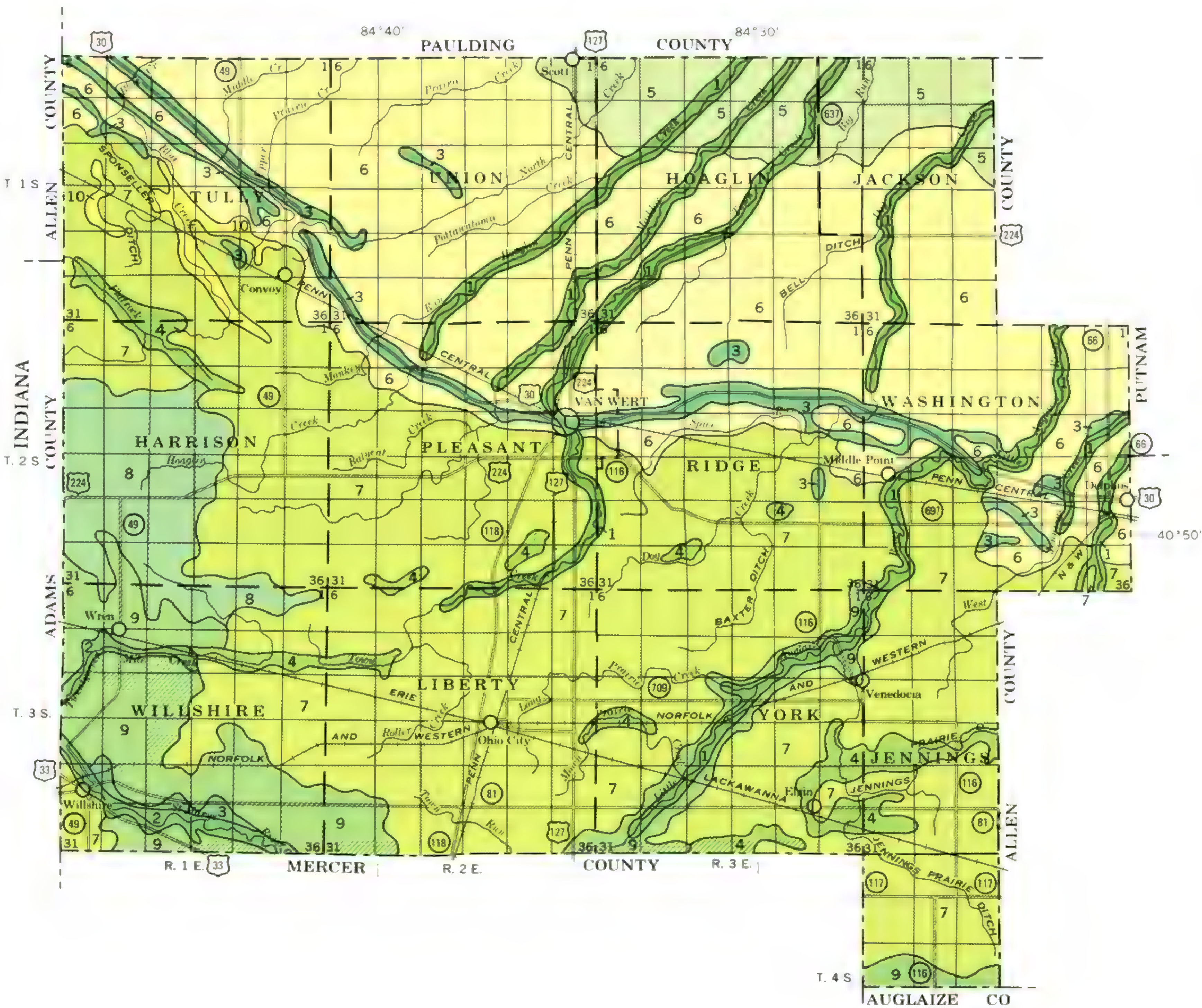


SOIL ASSOCIATIONS

1. Wabasha association: Very poorly drained soils on flood plains along the Little Auglaize River and its tributaries
2. Sloan association: Very poorly drained soils on flood plains along the St. Marys River and Twentyseven Mile Creek
3. Digby-Belmore-Haney association: Somewhat poorly drained to well-drained soils on beach ridges and stream terraces
4. Montgomery association: Very poorly drained, nearly level to depressional soils that are subject to ponding; on uplands
5. Latty association: Very poorly drained, nearly level soils on the lake plain
6. Hoytville association: Dark-colored, very poorly drained soils that formed in water-worked glacial till; on the lake plain
7. Pewamo-Blount association: Very poorly drained and somewhat poorly drained, nearly level to gently sloping soils on glacial till uplands
8. Blount-Pewamo association: Somewhat poorly drained and very poorly drained, gently sloping and nearly level soils on glacial till uplands
9. Blount-Morley association: Somewhat poorly drained soils and moderately well drained soils on the Fort Wayne moraine and on slope breaks along streams
10. Toledo association: Very poorly drained, nearly level soils along the south edge of the lake plain

March 1971

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LANDS AND SOIL,
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

GENERAL SOIL MAP
VAN WERT COUNTY, OHIO

Scale 1:190,080

1 0 1 2 3 4 Miles

NOTE—
This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning.

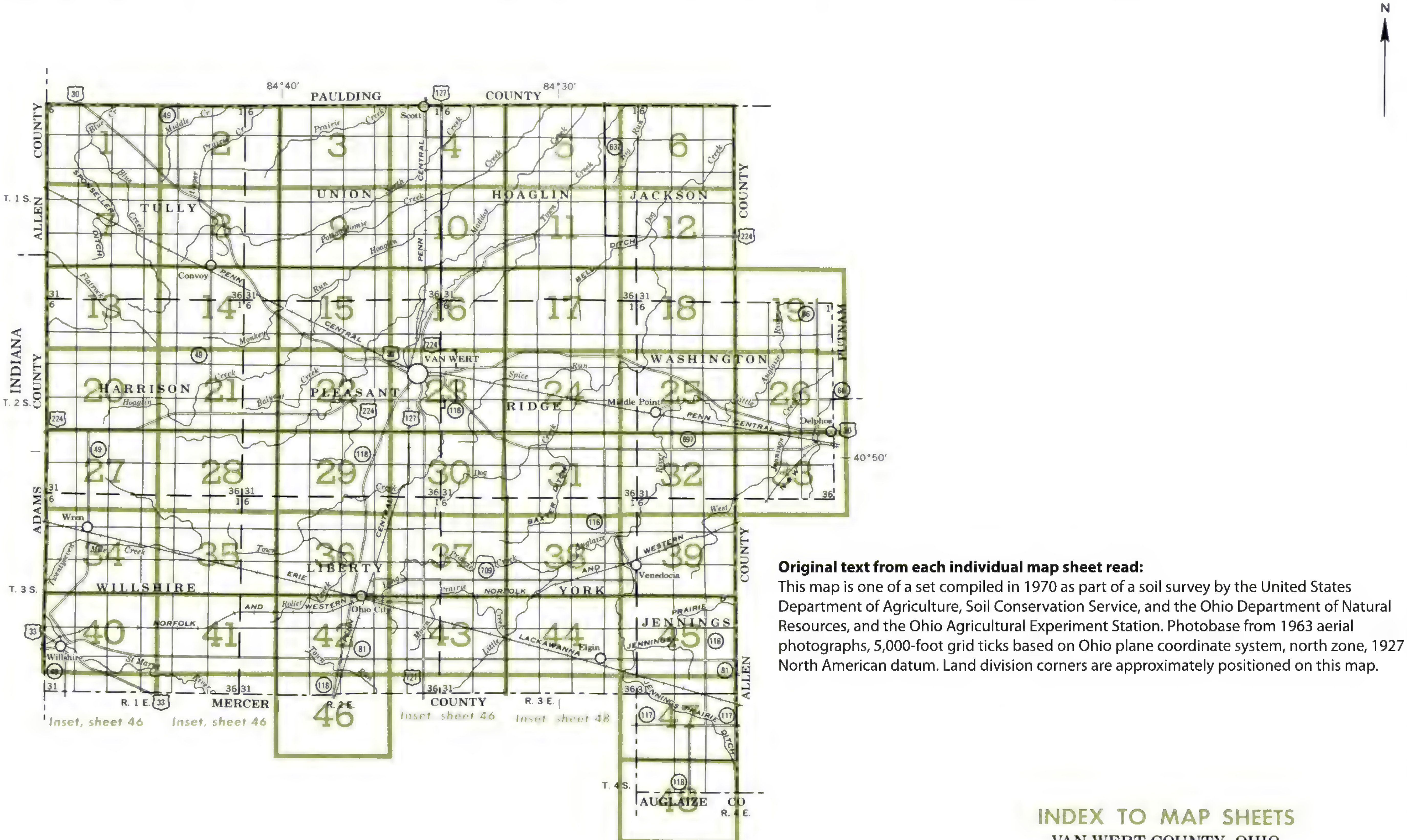
GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Estimated yields, table 1, page 12.
Use of the soils for wildlife, table 3, page 14.
Engineering uses of the soils, tables 4, 5, and 6, pages 18 through 33.
Soils and land use planning, table 7, page 36.
Acreage and extent, table 8, page 44.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page
BlB	Belmore sandy loam, 2 to 6 percent slopes	45	IIe-1	7
BmA	Belmore loam, 0 to 2 percent slopes	45	IIs-1	9
BmB	Belmore loam, 2 to 6 percent slopes	45	IIe-1	7
BmC	Belmore loam, 6 to 12 percent slopes	45	IIIe-1	9
BnA	Blount loam, 0 to 2 percent slopes	46	IIw-4	8
BnB	Blount loam, 2 to 6 percent slopes	46	IIw-4	8
BoA	Blount silt loam, 0 to 2 percent slopes	46	IIw-4	8
BoB	Blount silt loam, 2 to 6 percent slopes	46	IIw-4	8
BoB2	Blount silt loam, 2 to 6 percent slopes, moderately eroded	47	IIIe-3	10
Cp	Clay pits	47	------	--
Cw	Colwood silt loam	47	IIw-5	8
Cx	Cut and fill land	47	------	--
De	Defiance silt loam	48	IIIw-4	11
Df	Defiance silty clay loam	48	IIIw-4	11
DgA	Digby sandy loam, 0 to 2 percent slopes	49	IIw-3	8
DgB	Digby sandy loam, 2 to 6 percent slopes	49	IIw-3	8
DmA	Digby loam, 0 to 2 percent slopes	49	IIw-3	8
DmB	Digby loam, 2 to 6 percent slopes	49	IIw-3	8
Em	Eel silt loam	49	IIw-1	7
EoB	Elliott silt loam, 0 to 4 percent slopes	50	IIw-4	8
HaB	Haney sandy loam, 2 to 6 percent slopes	51	IIe-1	7
HdA	Haney loam, 0 to 2 percent slopes	51	I-1	7
HdB	Haney loam, 2 to 6 percent slopes	51	IIe-1	7
HkA	Haskins fine sandy loam, 0 to 2 percent slopes	52	IIw-3	8
HkB	Haskins fine sandy loam, 2 to 6 percent slopes	52	IIw-3	8
HnA	Haskins loam, 0 to 2 percent slopes	52	IIw-3	8
HnB	Haskins loam, 2 to 6 percent slopes	52	IIw-3	8
Ho	Hoytville silty clay loam	53	IIw-6	9
Hs	Hoytville silty clay loam, moderately shallow variant	53	IIIw-2	10
Hv	Hoytville clay	53	IIw-6	9
Ks	Kibbie silt loam	54	IIw-3	8
La	Latty silty clay loam	55	IIIw-5	11
Lc	Latty clay	54	IIIw-5	11
Mc	McGary silt loam	55	IIIw-1	10
Md	Mermill silt loam	56	IIw-5	8
Me	Millgrove silt loam	57	IIw-5	8
Mg	Millgrove silty clay loam	57	IIw-5	8
Mm	Montgomery silty clay loam	57	IIIw-5	11
Mn	Montgomery silty clay	57	IIIw-5	11
MoB	Morley loam, 2 to 6 percent slopes	58	IIe-2	7
MrB	Morley silt loam, 2 to 6 percent slopes	58	IIe-2	7
MrB2	Morley silt loam, 2 to 6 percent slopes, moderately eroded	58	IIIe-2	9
MrC2	Morley silt loam, 6 to 12 percent slopes, moderately eroded	58	IIIe-2	9
MrD2	Morley silt loam, 12 to 18 percent slopes, moderately eroded	59	IVe-1	11
NaA	Nappanee loam, 0 to 2 percent slopes	59	IIIw-1	10
NpA	Nappanee silt loam, 0 to 2 percent slopes	59	IIIw-1	10
NpB	Nappanee silt loam, 2 to 6 percent slopes	59	IIIw-3	10
NtA	Nappanee silty clay loam, 0 to 2 percent slopes	59	IIIw-1	10
NtB	Nappanee silty clay loam, 2 to 6 percent slopes	60	IIIw-3	10
NtB2	Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded	60	IIIw-3	10
Pm	Pewamo silty clay loam	60	IIw-6	9
Po	Pewamo silty clay	61	IIw-6	9
Qu	Quarry	61	-------	--
RmB	Rawson loam, 2 to 6 percent slopes	61	IIe-1	7
ScB	St. Clair silt loam, 2 to 6 percent slopes	62	IIIe-2	9
ScC2	St. Clair silt loam, 6 to 12 percent slopes, moderately eroded	62	IVe-2	12
Sh	Shoals silt loam	62	IIw-2	8
So	Sloan silty clay loam	63	IIIw-4	11
To	Toledo silty clay	63	IIIw-5	11
Wa	Wabasha silty clay loam	64	IIIw-4	11
Wb	Wabasha silty clay loam, moderately shallow variant	64	IIIw-4	11
Wh	Wabasha silty clay	64	IIIw-4	11

417-283 O - 72 (Faces Maps)



Original text from each individual map sheet read:
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Ohio Department of Natural Resources, and the Ohio Agricultural Experiment Station. Photobase from 1963 aerial photographs, 5,000-foot grid ticks based on Ohio plane coordinate system, north zone, 1927 North American datum. Land division corners are approximately positioned on this map.

INDEX TO MAP SHEETS

VAN WERT COUNTY, OHIO

Scale 1:190,080

1 0 1 2 3 4 Miles

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, or D, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range in slope. A final number, 2, in the symbol shows that the soil is moderately eroded.

SYMBOL	NAME
BlB	Belmore sandy loam, 2 to 6 percent slopes
BmA	Belmore loam, 0 to 2 percent slopes
BmB	Belmore loam, 2 to 6 percent slopes
BmC	Belmore loam, 6 to 12 percent slopes
BnA	Blount loam, 0 to 2 percent slopes
BnB	Blount loam, 2 to 6 percent slopes
BoA	Blount silt loam, 0 to 2 percent slopes
BoB	Blount silt loam, 2 to 6 percent slopes
BoB2	Blount silt loam, 2 to 6 percent slopes, moderately eroded
Cp	Clay pits
Cw	Colwood silt loam
Cx	Cut and fill land
De	Defiance silt loam
Df	Defiance silty clay loam
DgA	Digby sandy loam, 0 to 2 percent slopes
DgB	Digby sandy loam, 2 to 6 percent slopes
DmA	Digby loam, 0 to 2 percent slopes
DmB	Digby loam, 2 to 6 percent slopes
Em	Eel silt loam
EoB	Elliott silt loam, 0 to 4 percent slopes
HaB	Haney sandy loam, 2 to 6 percent slopes
HdA	Haney loam, 0 to 2 percent slopes
HdB	Haney loam, 2 to 6 percent slopes
HkA	Haskins fine sandy loam, 0 to 2 percent slopes
HkB	Haskins fine sandy loam, 2 to 6 percent slopes
HnA	Haskins loam, 0 to 2 percent slopes
HnB	Haskins loam, 2 to 6 percent slopes
Ho	Hoytville silty clay loam
Hs	Hoytville silty clay loam, moderately shallow variant
Hv	Hoytville clay
Ks	Kibbie silt loam
La	Latty silty clay loam
Lc	Latty clay
Mc	McGary silt loam
Md	Mermill silt loam
Me	Millgrove silt loam
Mg	Millgrove silty clay loam
Mm	Montgomery silty clay loam
Mn	Montgomery silty clay
MoB	Morley loam, 2 to 6 percent slopes
MrB	Morley silt loam, 2 to 6 percent slopes
MrB2	Morley silt loam, 2 to 6 percent slopes, moderately eroded
MrC2	Morley silt loam, 6 to 12 percent slopes, moderately eroded
MrD2	Morley silt loam, 12 to 18 percent slopes, moderately eroded
NaA	Nappanee loam, 0 to 2 percent slopes
NpA	Nappanee silt loam, 0 to 2 percent slopes
NpB	Nappanee silt loam, 2 to 6 percent slopes
NtA	Nappanee silty clay loam, 0 to 2 percent slopes
NtB	Nappanee silty clay loam, 2 to 6 percent slopes
NtB2	Nappanee silty clay loam, 2 to 6 percent slopes, moderately eroded
Pm	Pewamo silty clay loam
Po	Pewamo silty clay
Qu	Quarry
RmB	Rawson loam, 2 to 6 percent slopes
ScB	St. Clair silt loam, 2 to 6 percent slopes
ScC2	St. Clair silt loam, 6 to 12 percent slopes, moderately eroded
Sh	Shoals silt loam
So	Sloan silty clay loam
To	Toledo silty clay
Wa	Wabasha silty clay loam
Wb	Wabasha silty clay loam, moderately shallow variant
Wh	Wabasha silty clay

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Sawmill

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches — CANAL

Lakes and ponds
- Perennial — water, w
- Intermittent — int

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

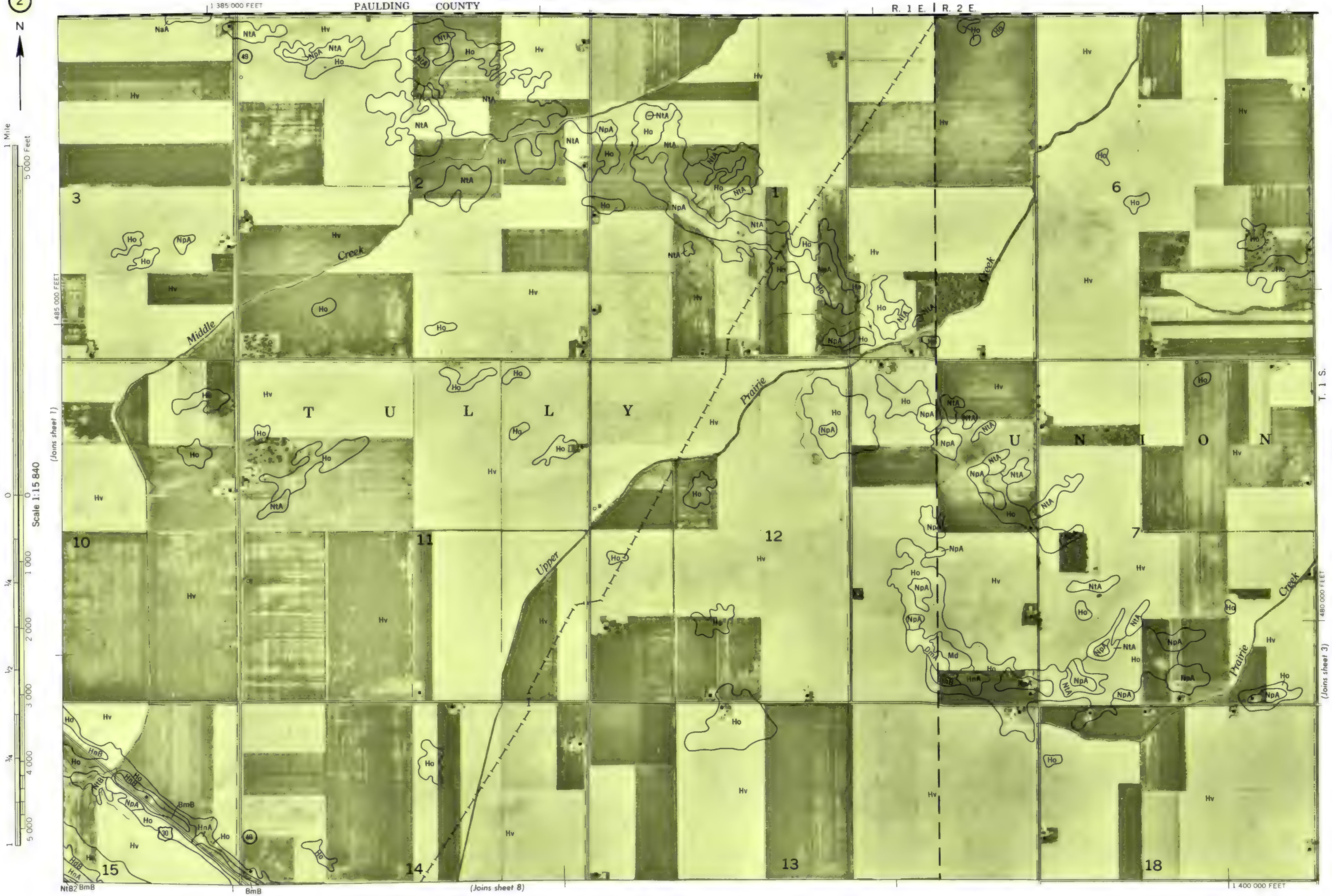
Prominent peak

Depressions and sinkholes (Large, Small)
- Unclassified
- Contains water most of the time

SOIL SURVEY DATA

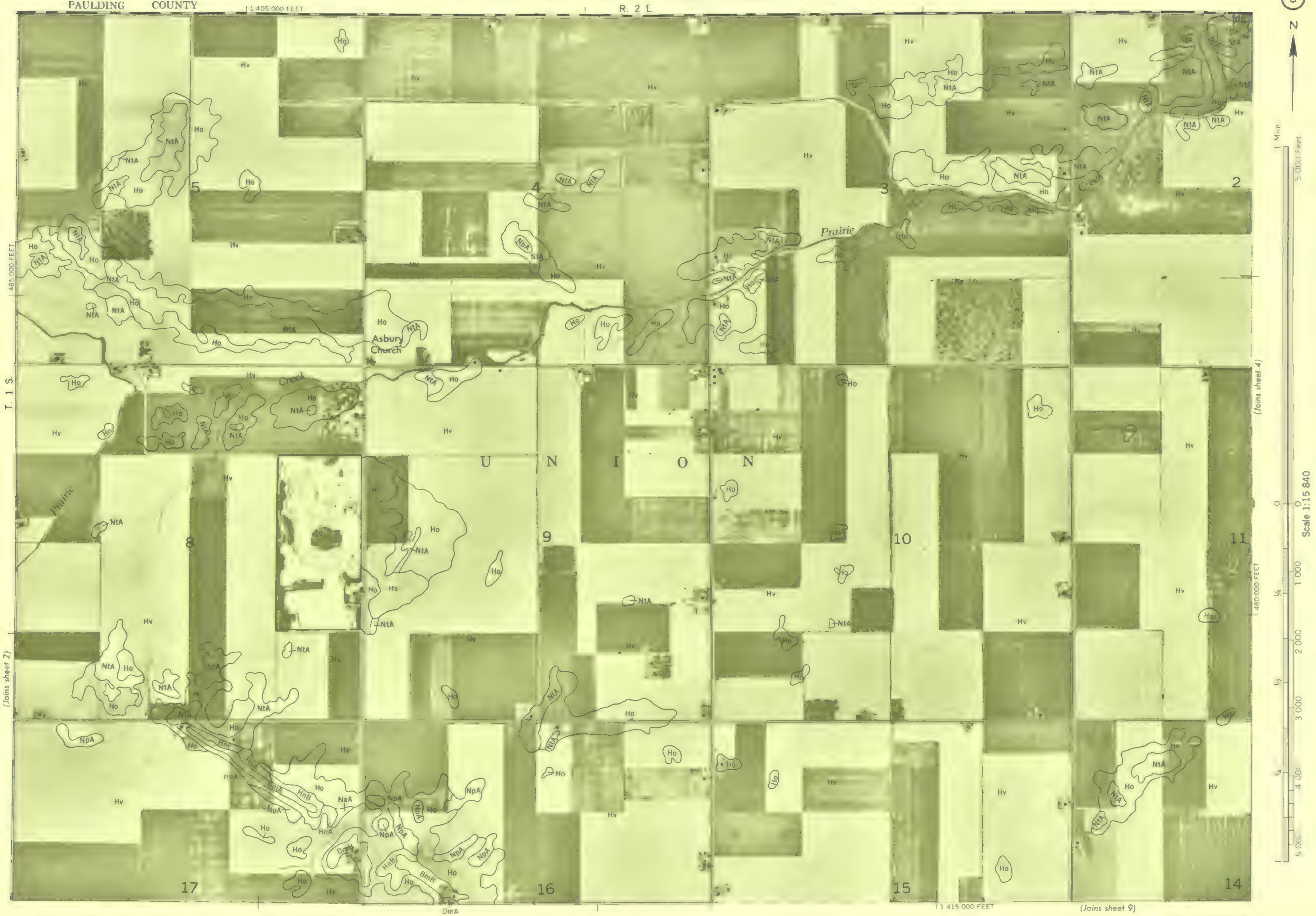
- Soil boundary and symbol — Dx
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

VAN WERT COUNTY, OHIO — SHEET NUMBER 1


2
N
PAULDING COUNTY
1 385 000 FEET
R. 1 E.
R. 2 E.
T. 1 S.
485 000 FEET
480 000 FEET
1 400 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 8)
T U L L Y
U N I O N
Middle Creek
Upper Prairie Creek
Prairie Creek
3
2
1
6
10
11
12
7
15
14
13
18
Hv
Ho
NtA
NpA
NaA
HnB
HnA
BmB
NtB2
Md
DmA
HoB

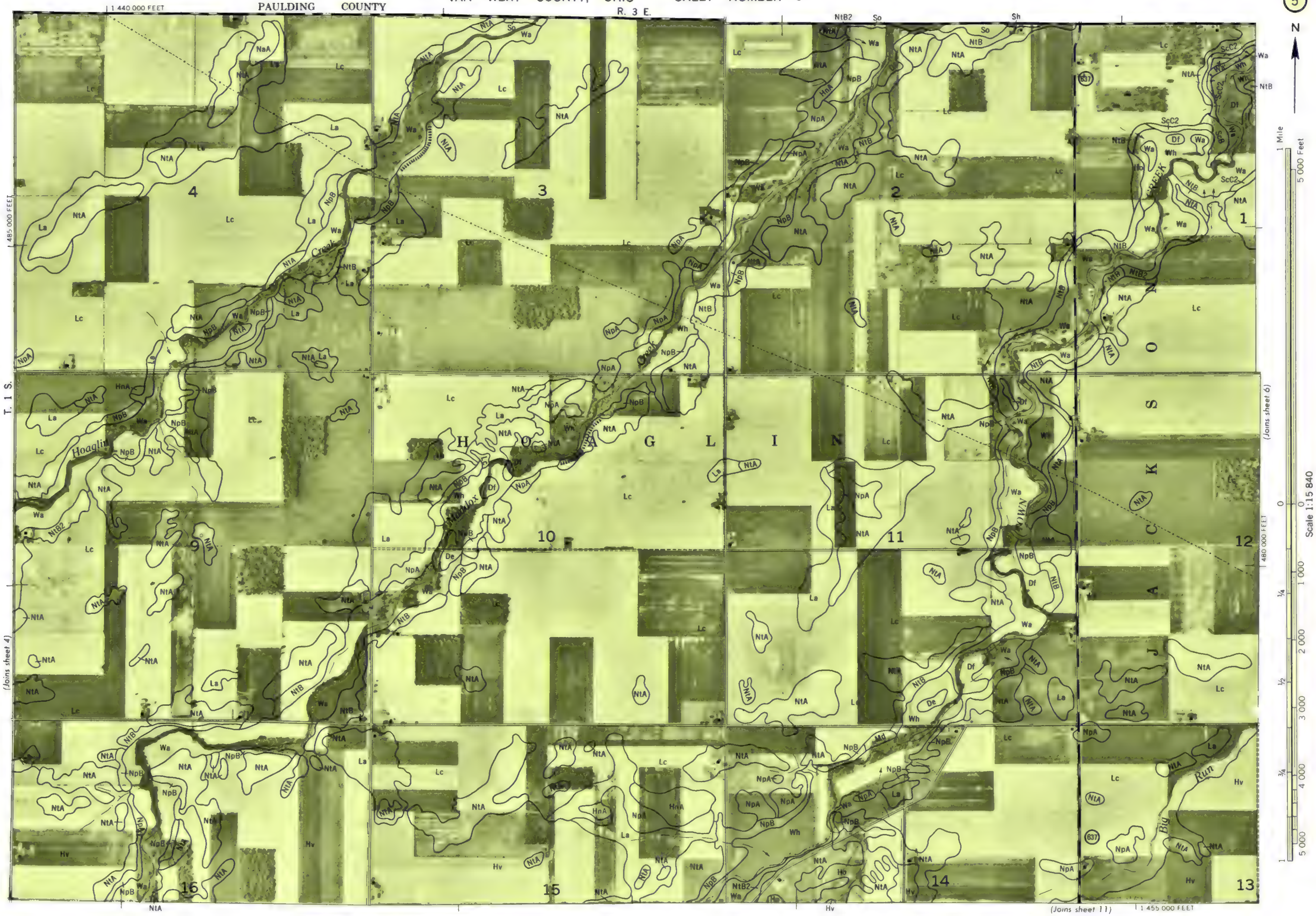
VAN WERT COUNTY, OHIO — SHEET NUMBER 3

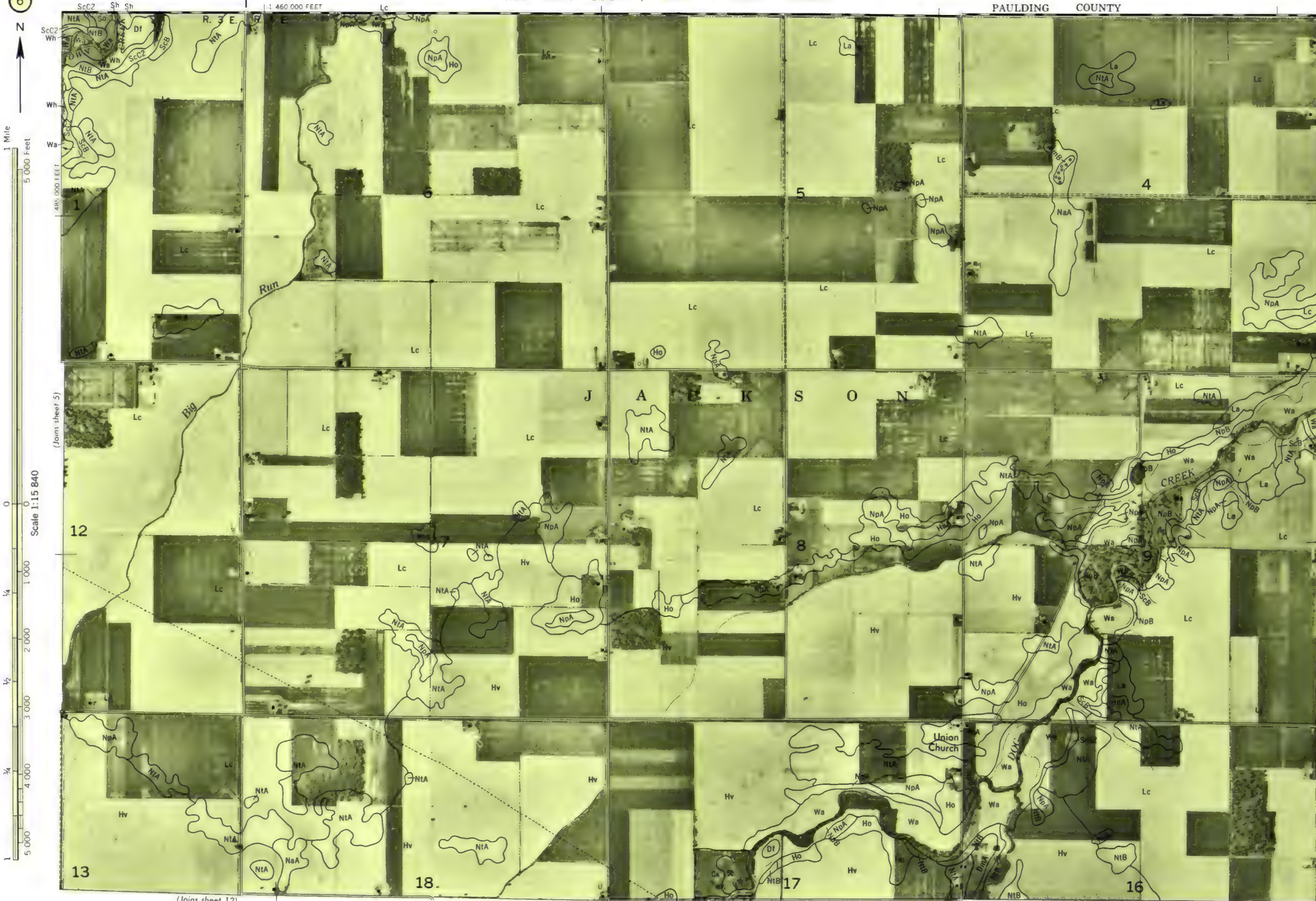
3

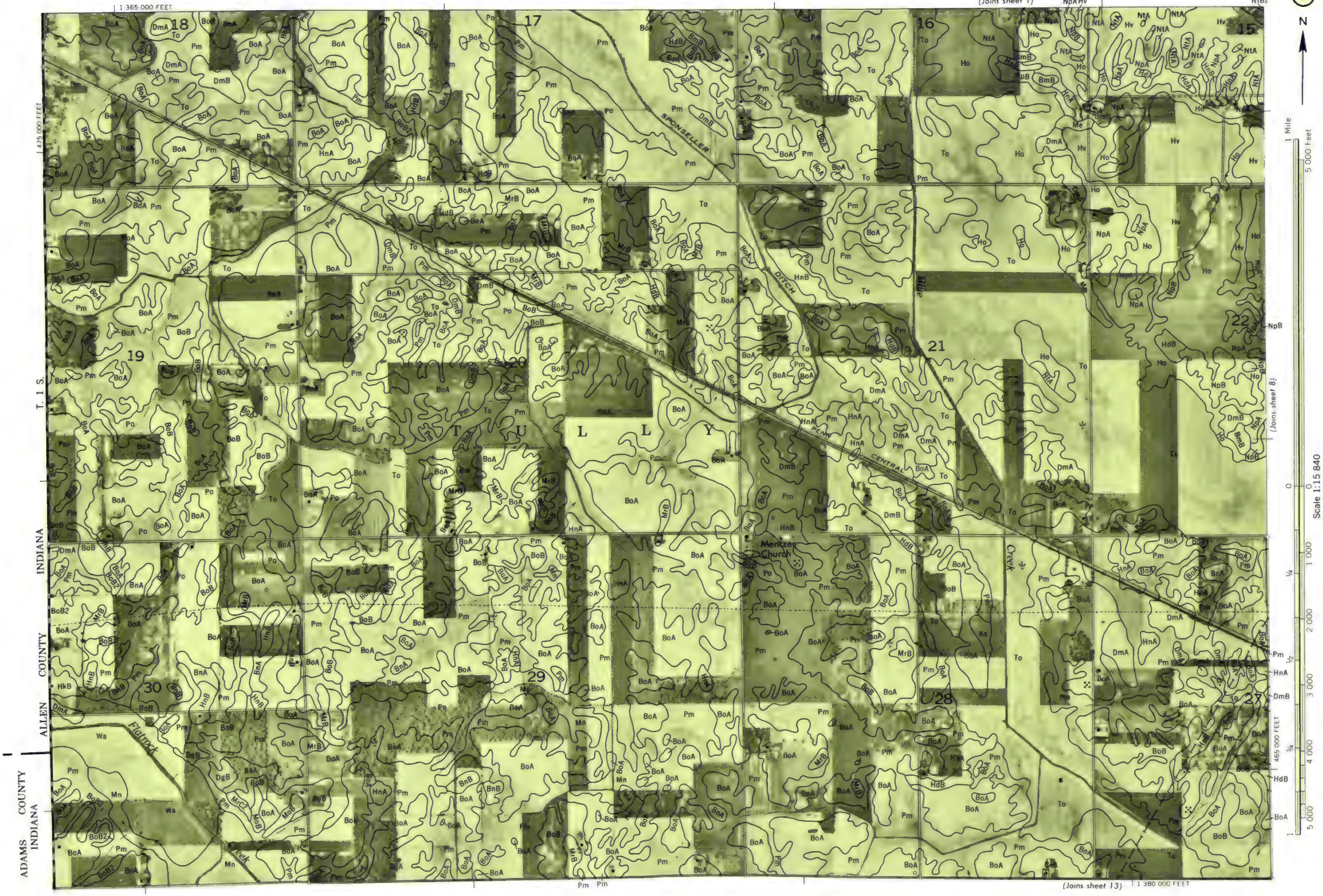



PAULDING COUNTY
1 420 000 FEET
OAKLAND CEMETERY
Scott
R. 2 E.
R. 3 E.
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 10)
485 000 FEET
480 000 FEET
1 435 000 FEET
T. 1 S.
U N I O N
H O A G L I N
PENN CENTRAL
Grand Victory Church
Hoaglin Creek
North Creek
2
1
6
5
11
12
7
8
14
13
18
17

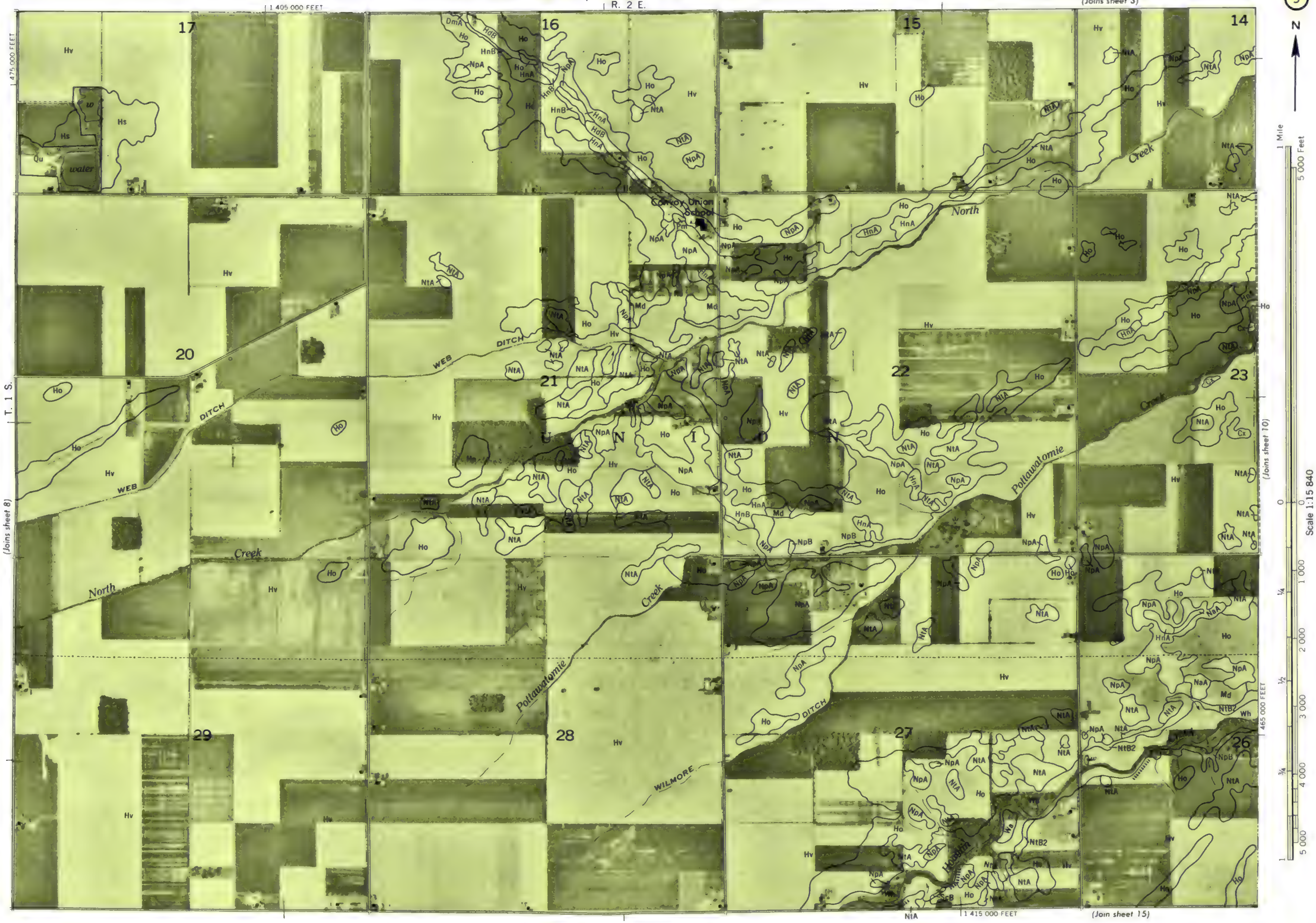
VAN WERT COUNTY, OHIO — SHEET NUMBER 5



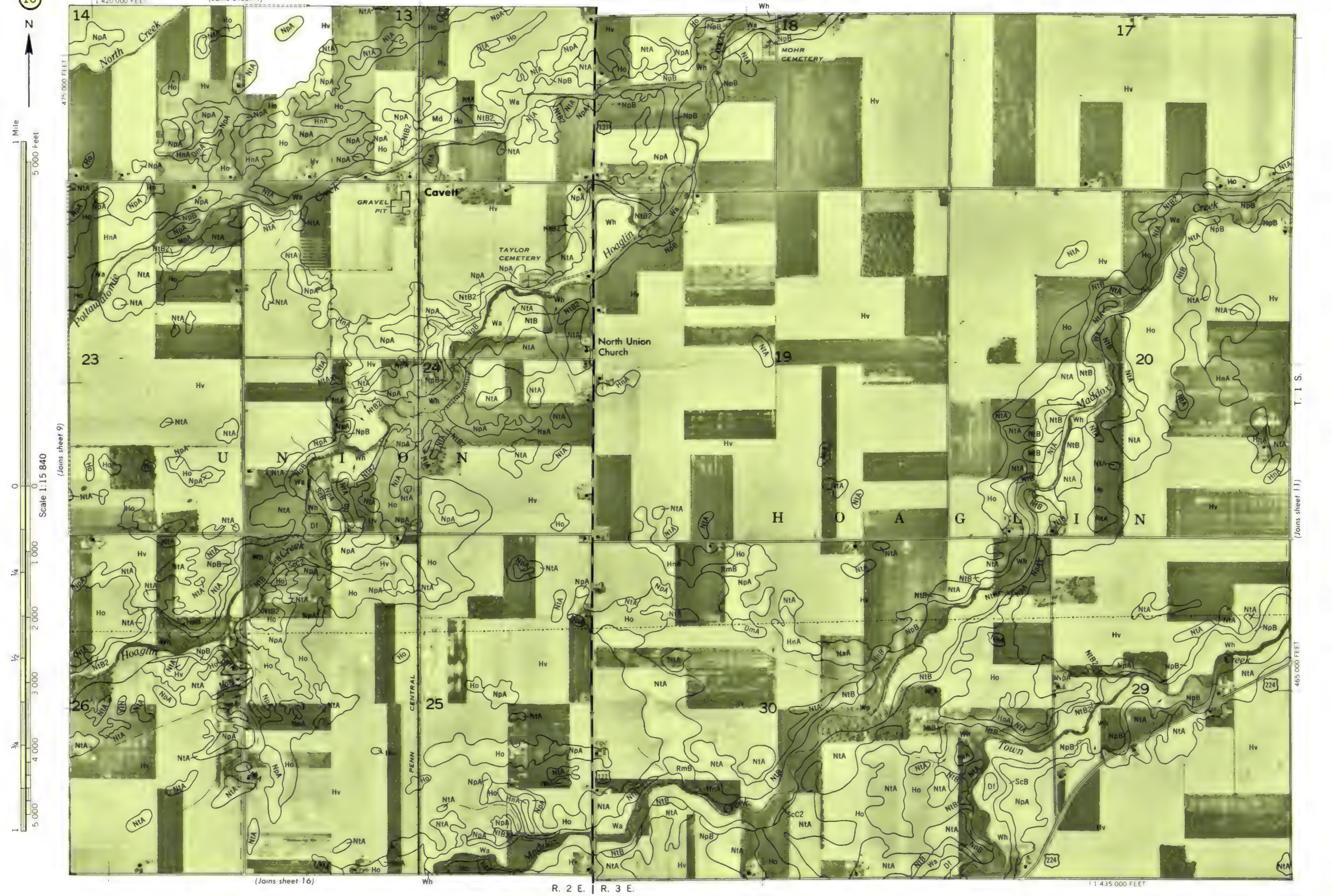

PAULDING COUNTY
PUTNAM COUNTY
R. 3 E. R. 4 E.
T. 1 S.
J A C K S O N
Big Run
CREEK
DOG
Union Church
(Joins sheet 5)
(Joins sheet 12)
1 460 000 FEET
1 475 000 FEET
480 000 FEET
475 000 FEET
N
Scale 1:15 840
1 Mile
5 000 Feet
1
4
5
6
7
8
9
12
13
16
17
18

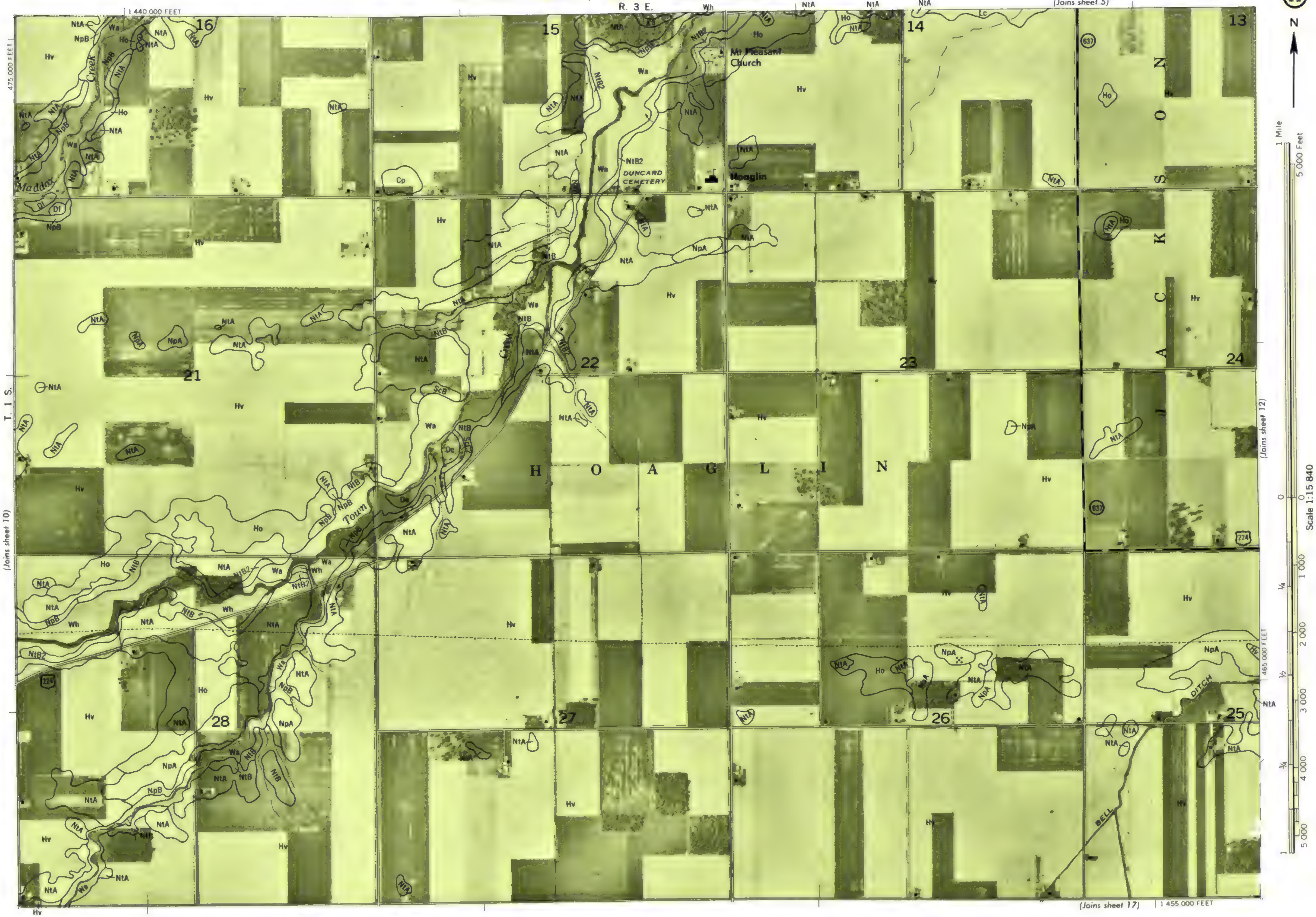

1 365 000 FEET
475 000 FEET
(Joins sheet 1)
(Joins sheet 8)
(Joins sheet 13)
1 380 000 FEET
465 000 FEET
N
T. 1 S.
TULLY
SPONSELLER
DITCH
PENN CENTRAL
Blue Creek
Flatrock Creek
Mentzer Church
INDIANA
ALLEN COUNTY
ADAMS COUNTY
INDIANA
15
16
17
18
19
20
21
22
27
28
29
30
1 Mile
5 000 Feet
Scale 1:15 840

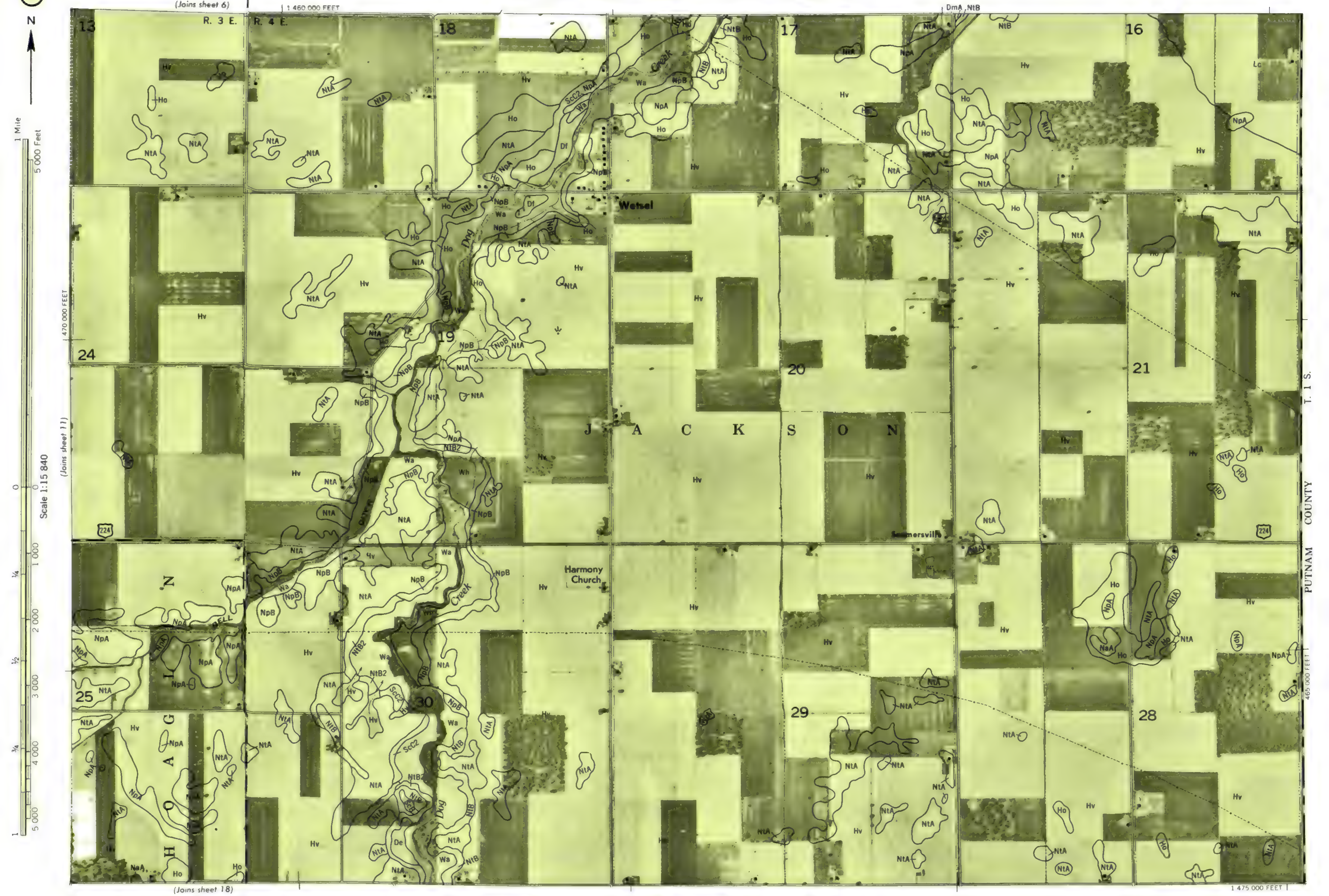

(Joins sheet 2)
1 385 000 FEET
R. 1 E. | R. 2 E.
Friends Church
Sugar Ridge Church
TOWNSHIP CEMETERY
T U L L Y
U N I O N
North Creek
Hagerman Creek
Upper Prairie Creek
PENN CENTRAL
Convoy
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 14)
T. 1 S.
465 000 FEET
1 400 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840


1 405 000 FEET
R. 2 E.
(Joins sheet 3)
475 000 FEET
T. 1 S.
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 15)
1 415 000 FEET
465 000 FEET
17
16
15
14
20
21
22
23
29
28
27
26
Convoy Union School
UNION
North Creek
WEB DITCH
Pollawatomie Creek
WILMORE DITCH
Hoaglin
water
N
Scale 1:15 840
1 Mile
5 000 Feet

VAN WERT COUNTY, OHIO — SHEET NUMBER 10

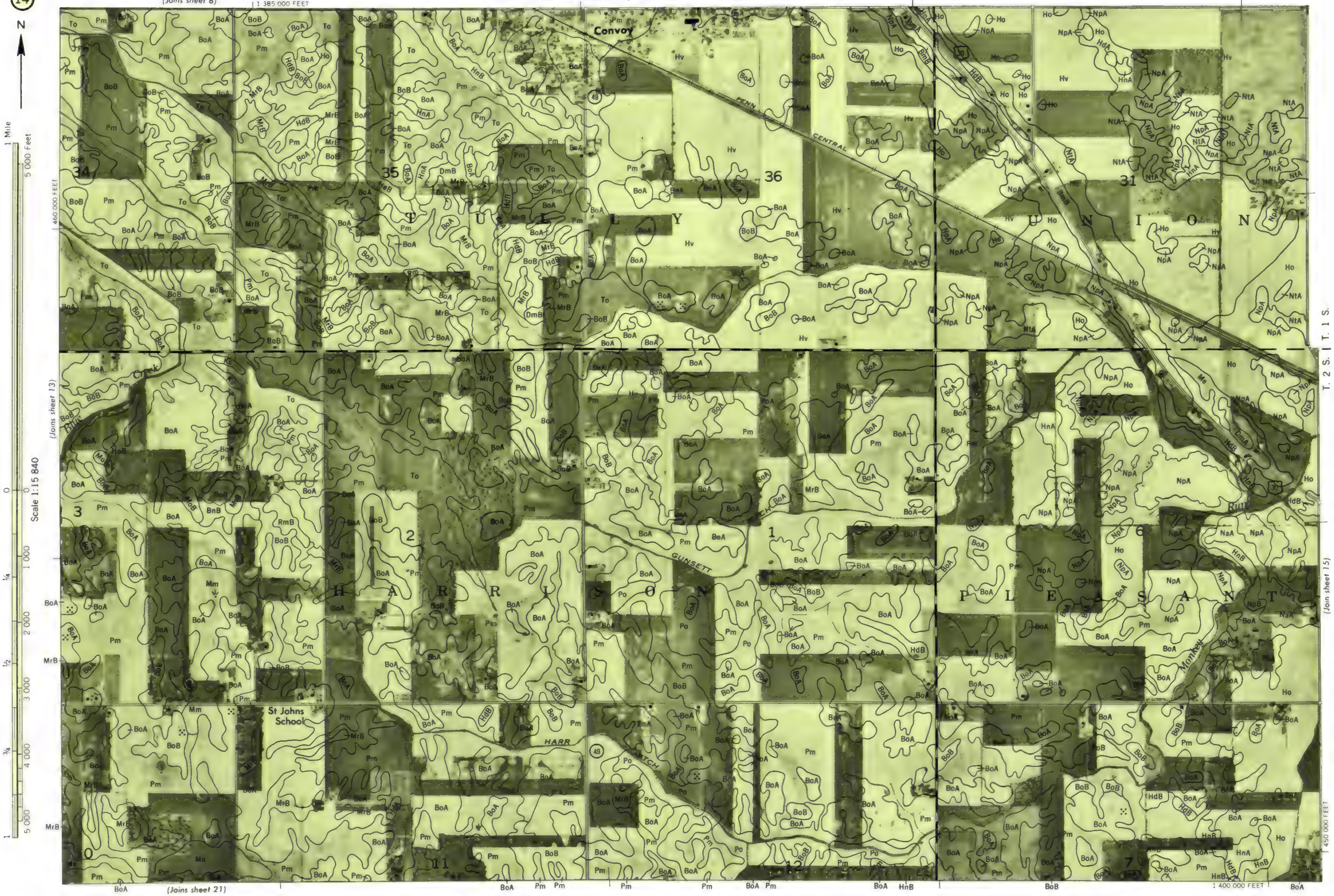



11
N
R. 3 E.
T. 1 S.
(Joins sheet 5)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 17)
1 440 000 FEET
475 000 FEET
465 000 FEET
1 455 000 FEET
Mt Pleasant Church
Hoaglin
DUNCARD CEMETERY
H O A G L I N
J A C K S O N
Maddox Creek
Town Creek
BELL DITCH
16
15
14
13
21
22
23
24
28
27
26
25
1 Mile
5 000 Feet
Scale 1:15 840


(Joins sheet 6)
1 460 000 FEET
R. 3 E.
R. 4 E.
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 11)
470 000 FEET
Wetsel
Dog Creek
J A C K S O N
Harmony Church
Sumersville
PUTNAM COUNTY
T. 1 S.
H O A G L I N
465 000 FEET
1 475 000 FEET
(Joins sheet 18)

VAN WERT COUNTY, OHIO — SHEET NUMBER 13

VAN WERT COUNTY, OHIO — SHEET NUMBER 14



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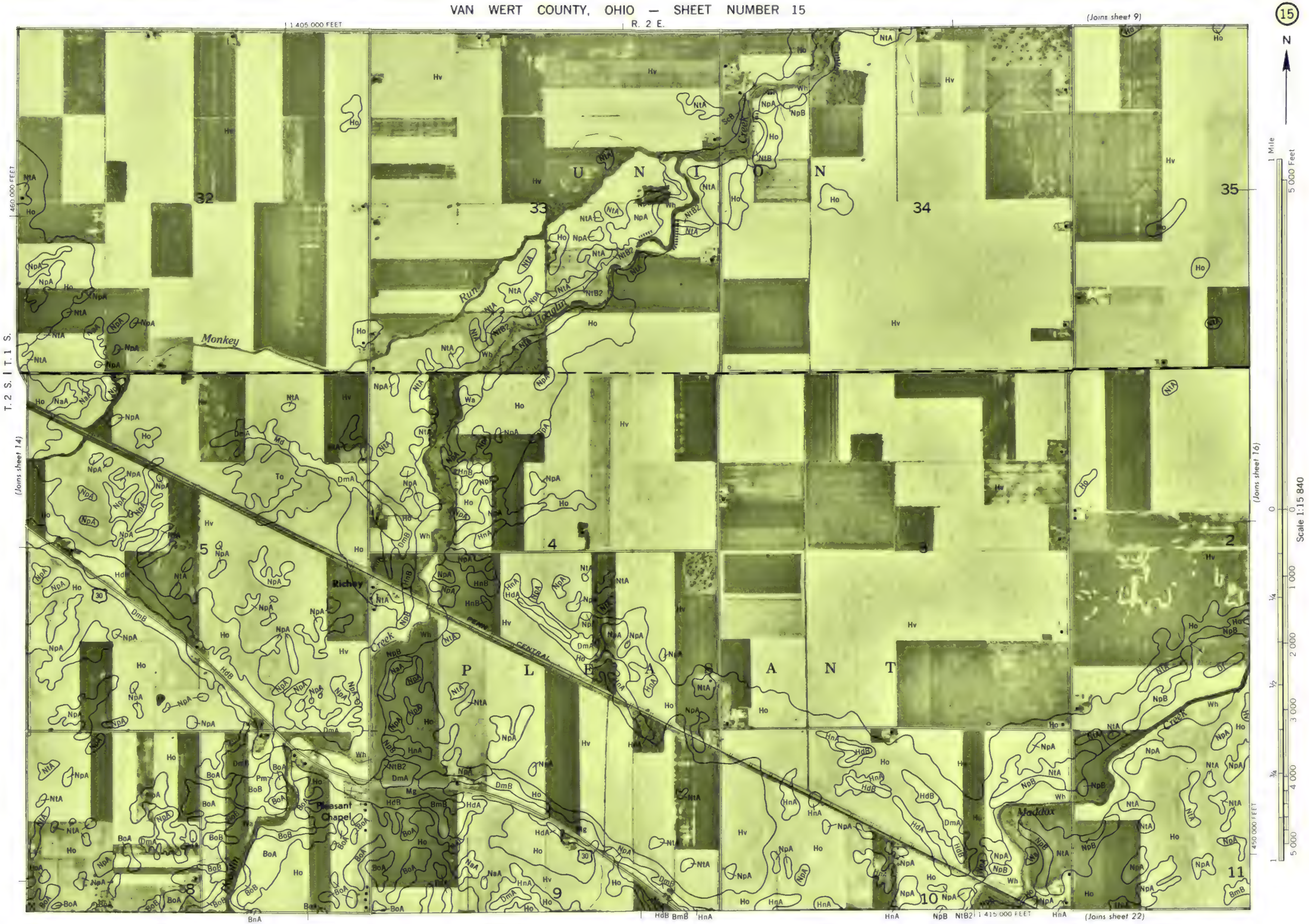
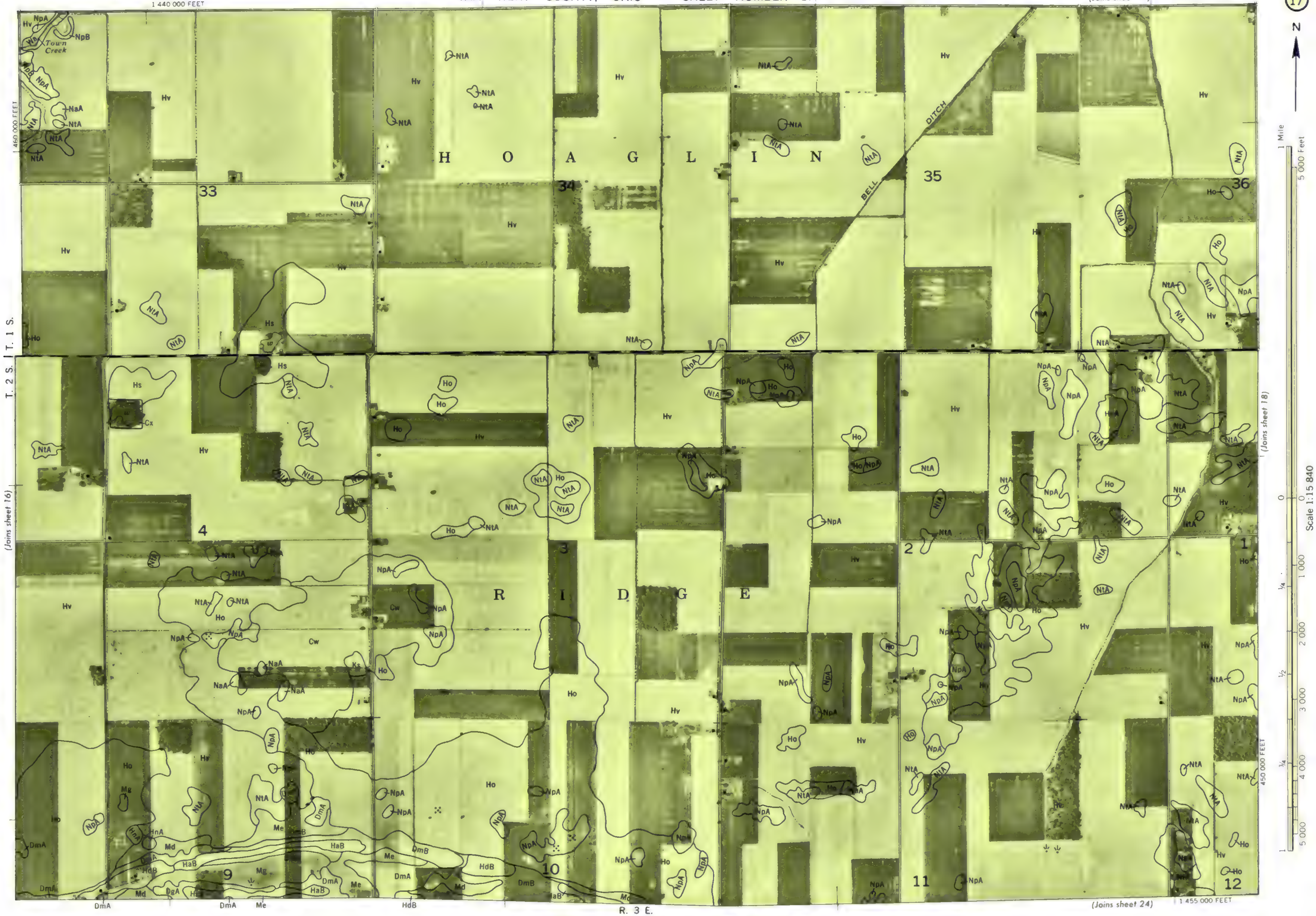



16
(Joins sheet 10)
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 23)
1 420 000 FEET
460 000 FEET
450 000 FEET
1 435 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
UNION
HOAGLIN
PLEASANT
RIDGE
VAN WERT
(county seat)
T. 1 S.
T. 2 S.
R. 2 E.
R. 3 E.

VAN WERT COUNTY, OHIO — SHEET NUMBER 17



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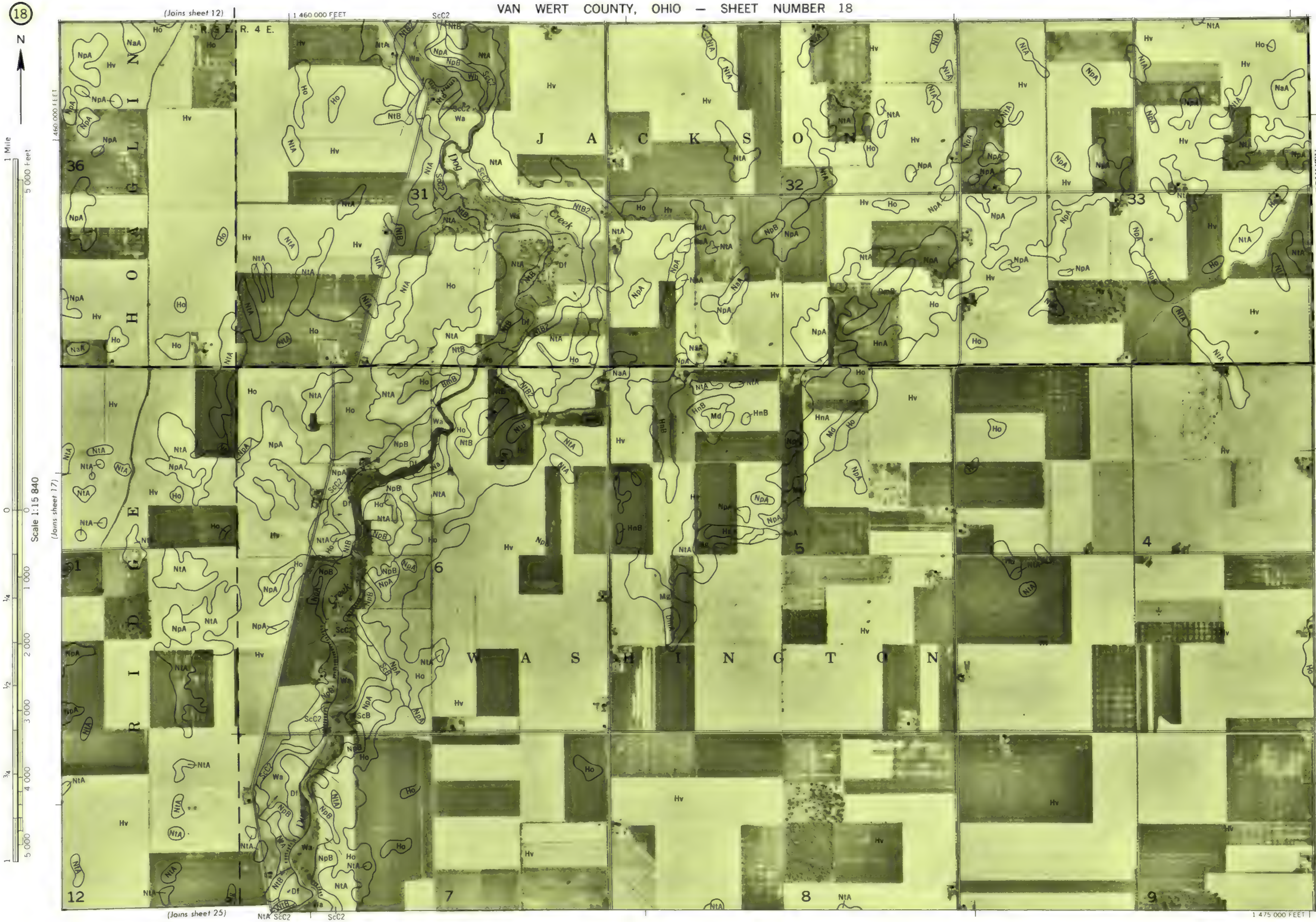
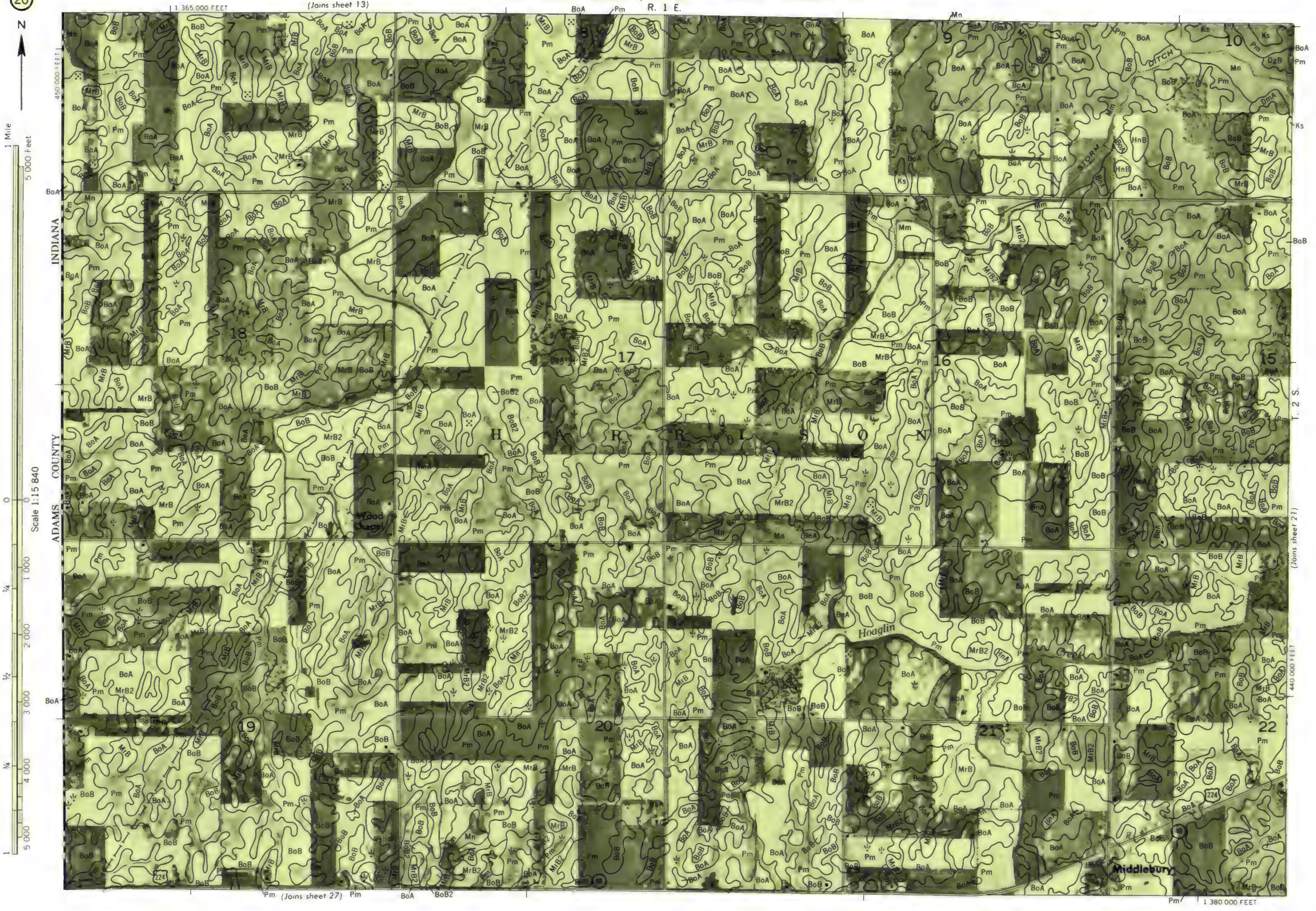
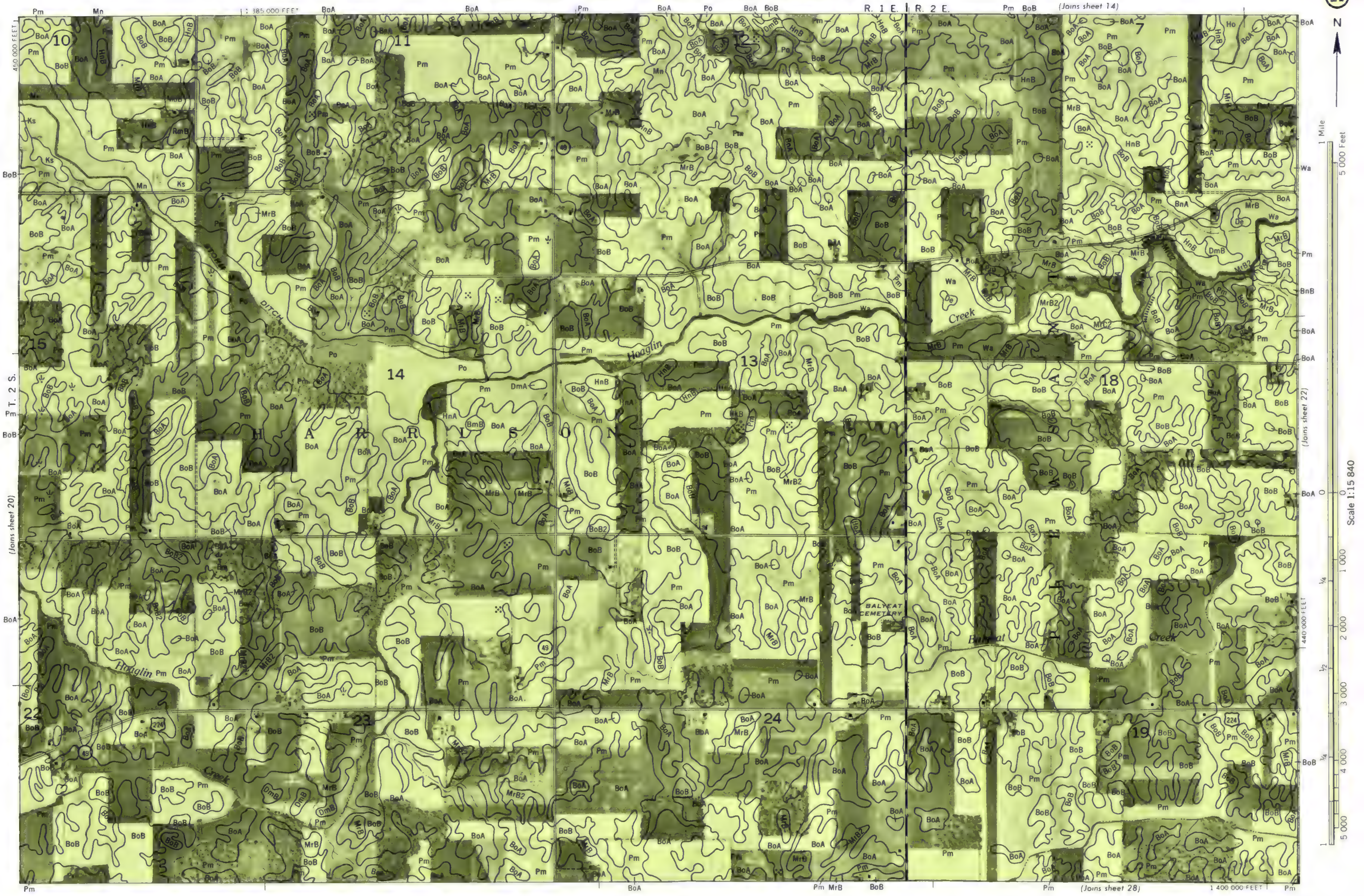


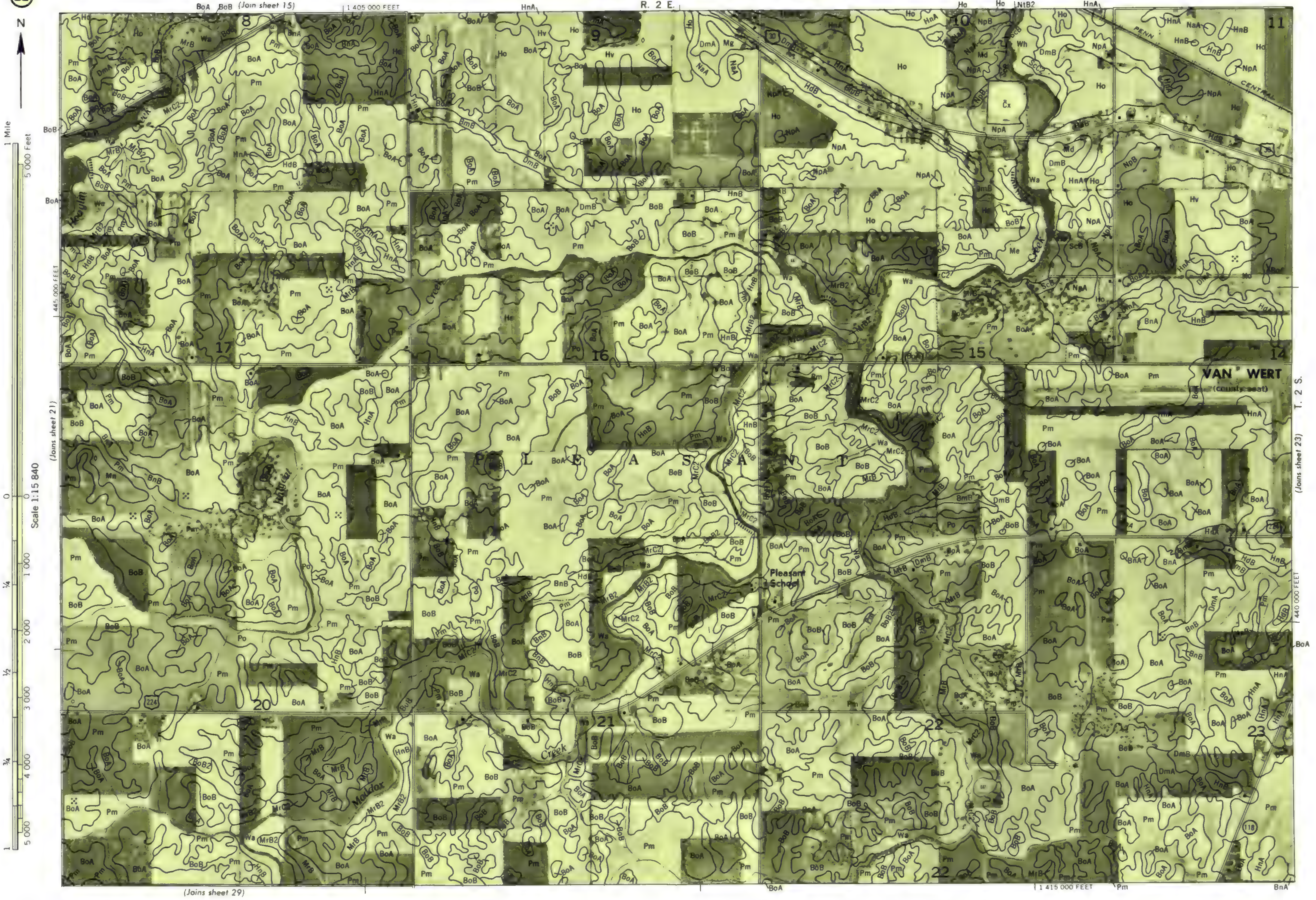

N
1 480 000 FEET
460 000 FEET
T. 1 S.
T. 2 S.
(Joins sheet 18)
PUTNAM COUNTY
W A S H I N G T O N
LITTLE AUGLAIZE
PUTNAM COUNTY
R. 4 E.
(Joins sheet 26)
1 490 000 FEET
450 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
0
¼
½
¾
1 000
2 000
3 000
4 000
5 000

VAN WERT COUNTY, OHIO — SHEET NUMBER 20

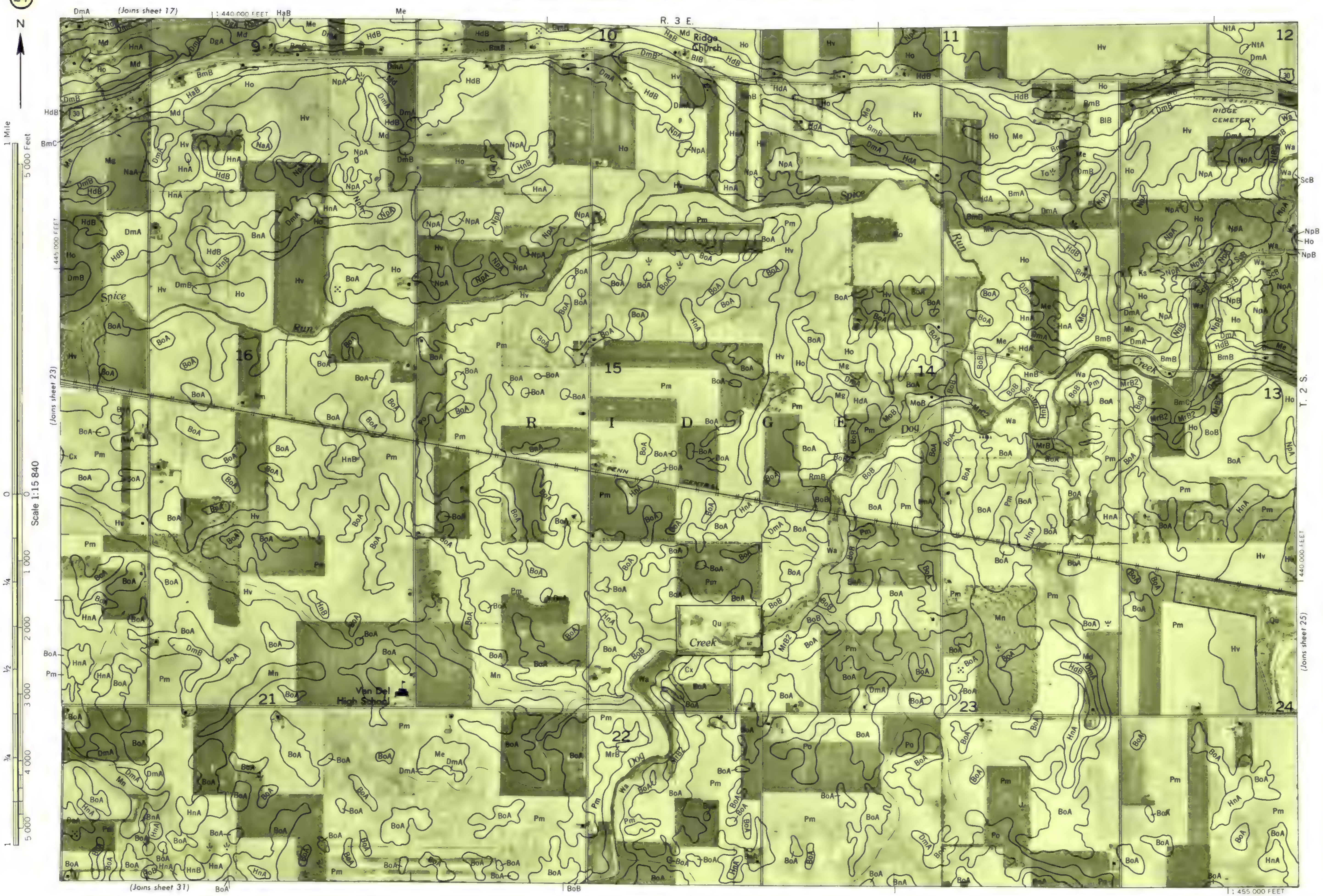



(Joins sheet 14)
(Joins sheet 22)
(Joins sheet 28)
(Joins sheet 20)
R. 1 E.
R. 2 E.
T. 2 S.
N
1 385 000 FEET
1 400 000 FEET
450 000 FEET
440 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
H A R R I S O N
P L E A S A N T
Hoaglin
Hoaglin Creek
Creek
Balyeat Creek
BALYEAT CEMETERY
DITCH
10
11
12
7
13
14
15
18
19
22
23
24
224
49

VAN WERT COUNTY, OHIO — SHEET NUMBER 22

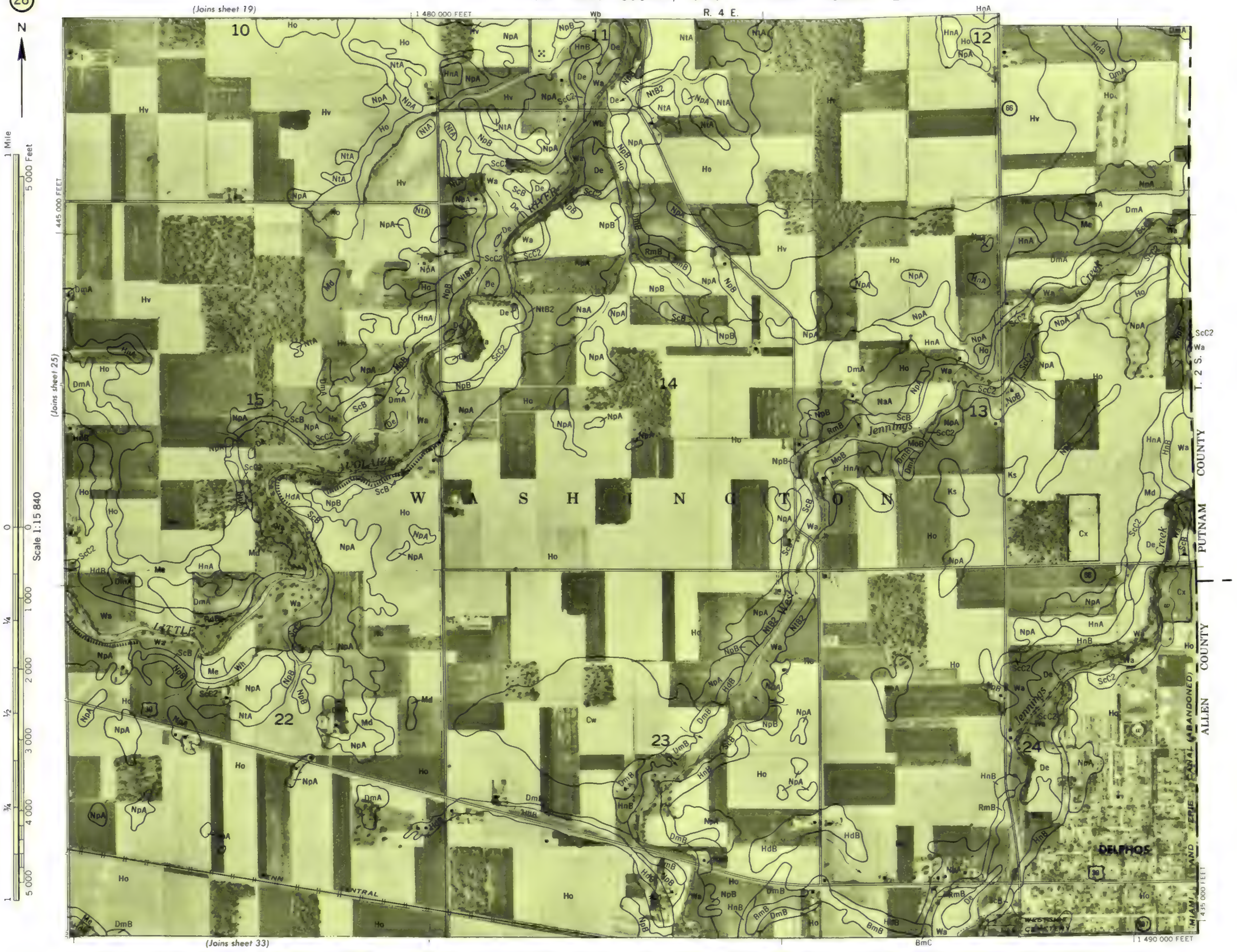


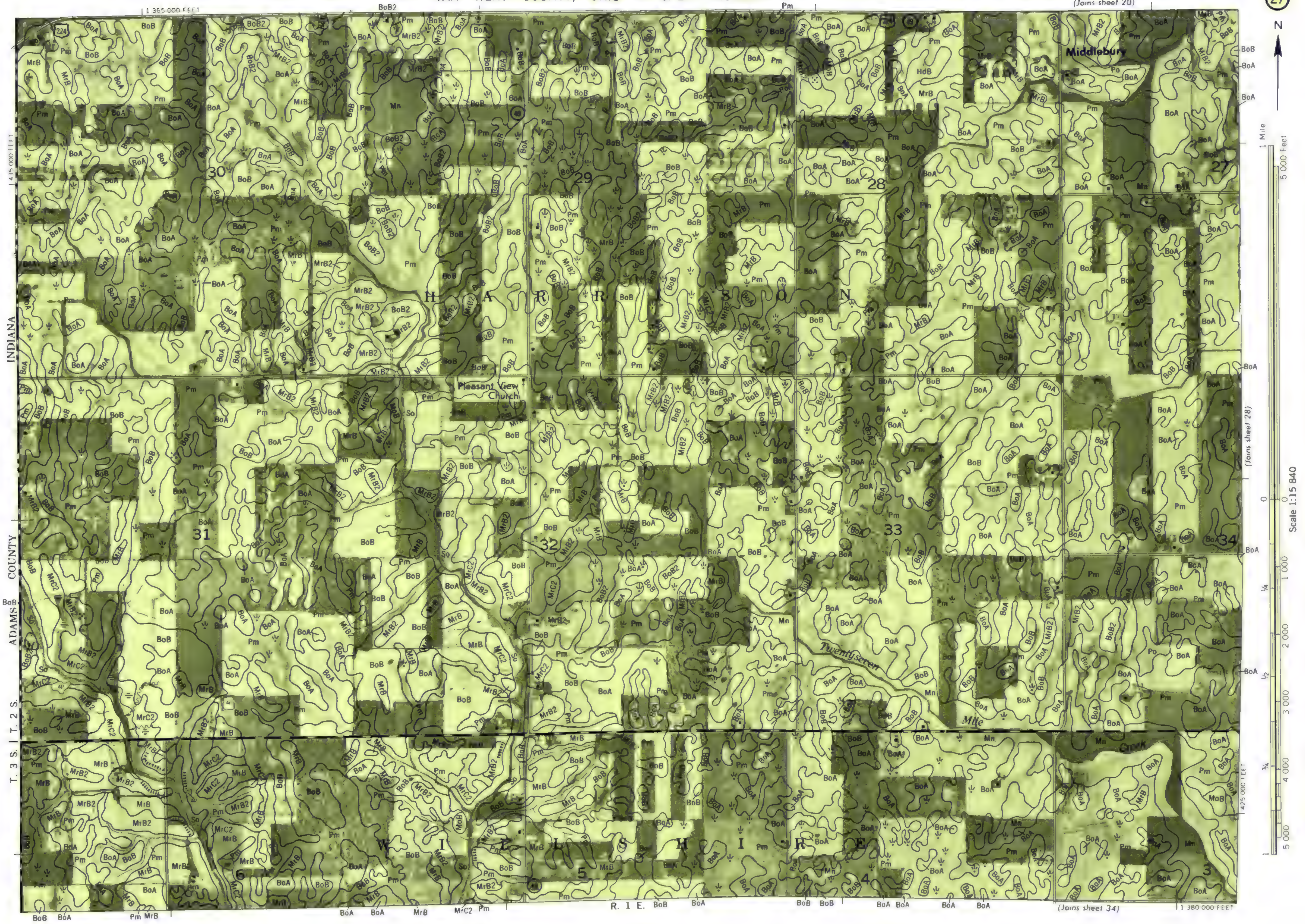

(Joins sheet 16)
(Joins sheet 24)
(Joins sheet 30)
(Joins sheet 22)
R. 2 E.
R. 3 E.
T. 2 S.
VAN WERT
(county seat)
Anthony Wayne School
Horace Mann School
Marsh Foundation School
Washington School
Franklin School
St Marys School
CITY RESERVOIR
PENN CENTRAL
P L E A S A N T
R I D G E
Town Creek
Run
1 420 000 FEET
445 000 FEET
440 000 FEET
1 435 000 FEET
Scale 1:15 840
N

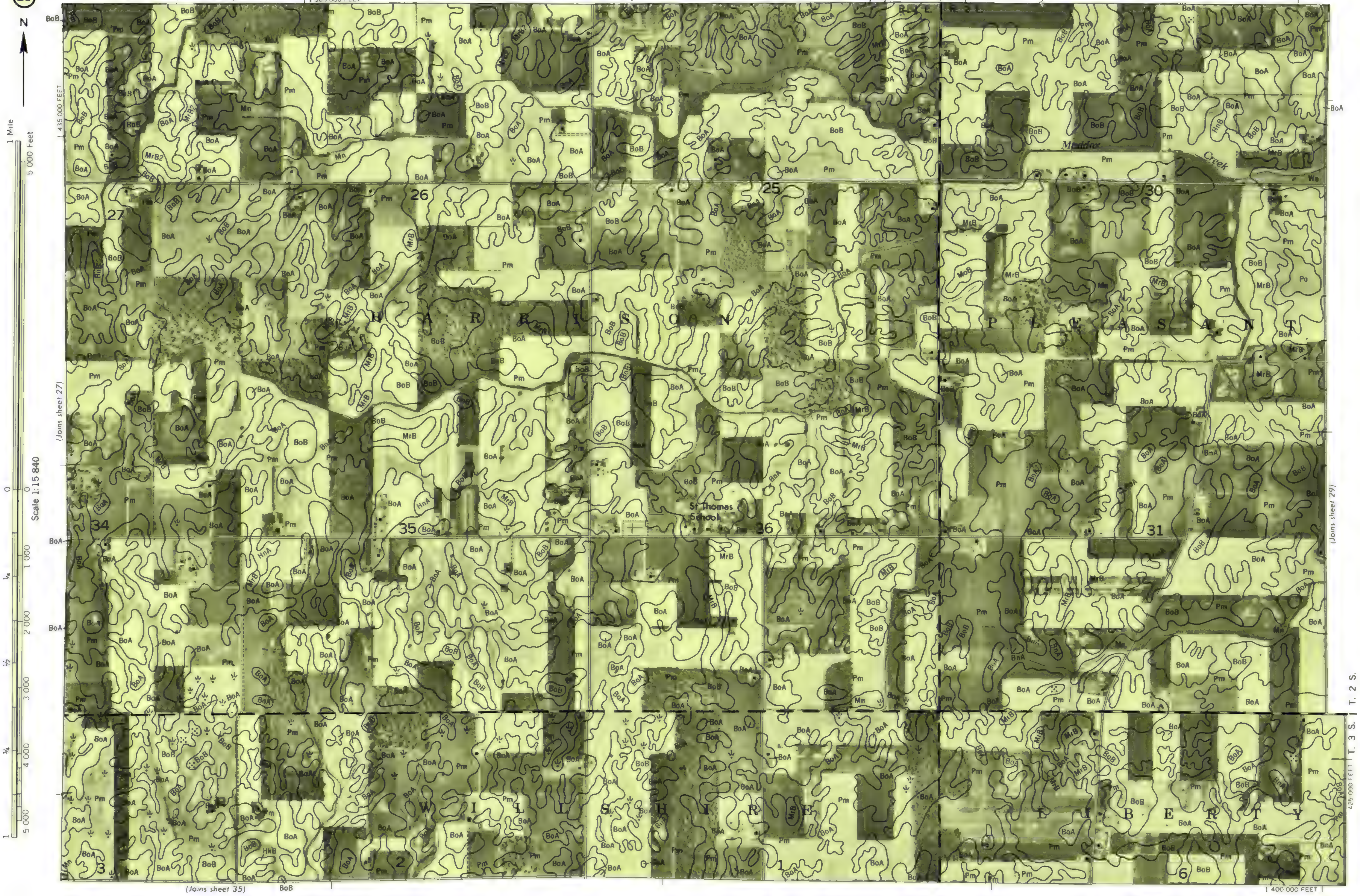

(Joins sheet 17)
1 : 440 000 FEET
R. 3 E.
Ridge Church
RIDGE CEMETERY
Spice Run
Spice Run
Run
Creek
Dog
Dog
Creek
R I D G E
PENN CENTRAL
Van Del High School
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 31)
445 000 FEET
440 000 FEET
455 000 FEET
T. 2 S.
N
1 Mile
5 000 Feet
Scale 1:15 840
9
10
11
12
13
14
15
16
21
22
23
24


R. 3 E.
R. 4 E.
1 460 000 FEET
(Joins sheet 18)
N
T. 2 S.
445 000 FEET
RIDGE
WASHINGTON
Dog Creek
River
Little
KING CEMETERY
Middle Point
PENN CENTRAL
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 32)
1 470 000 FEET
440 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet

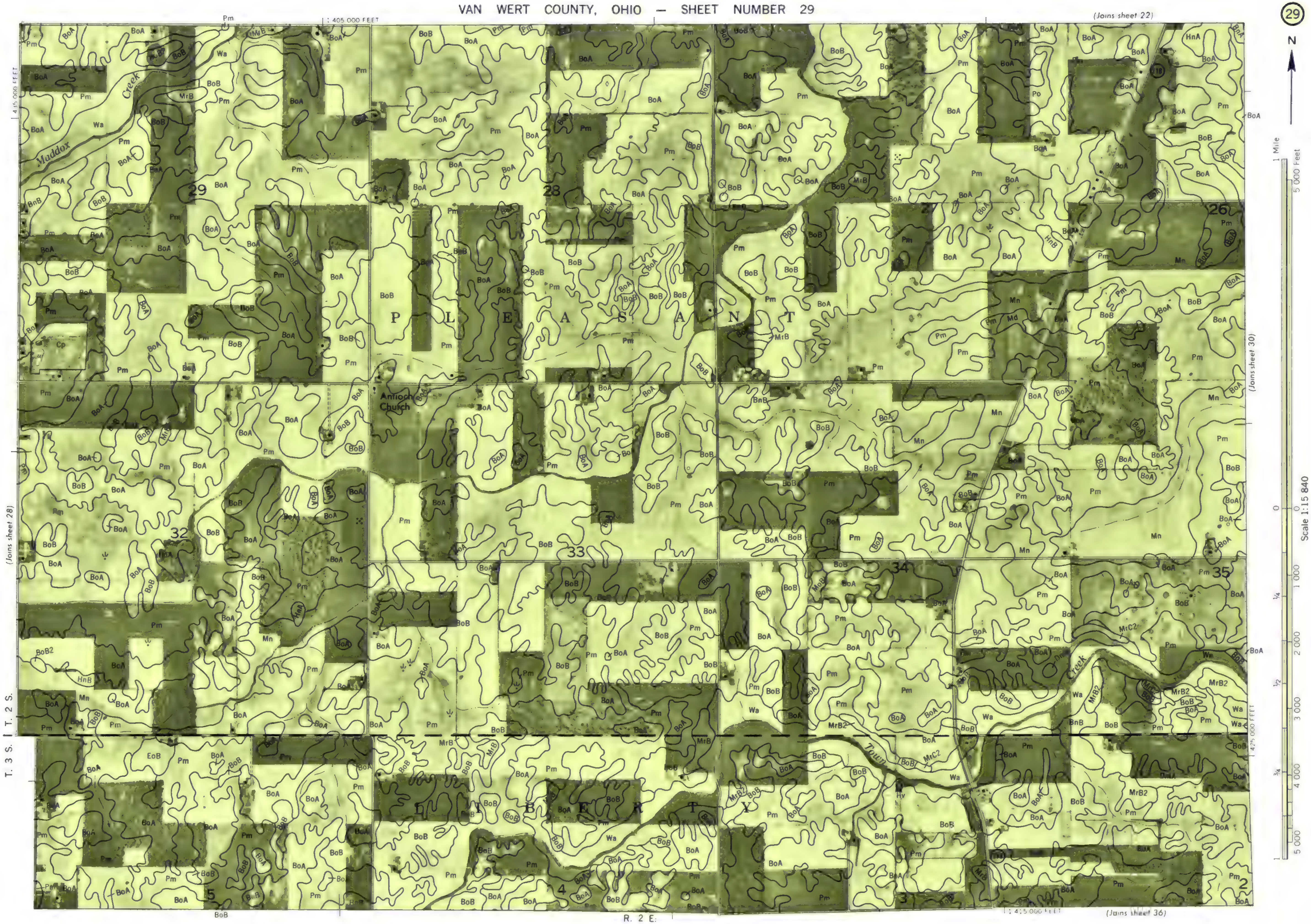
VAN WERT COUNTY, OHIO — SHEET NUMBER 26

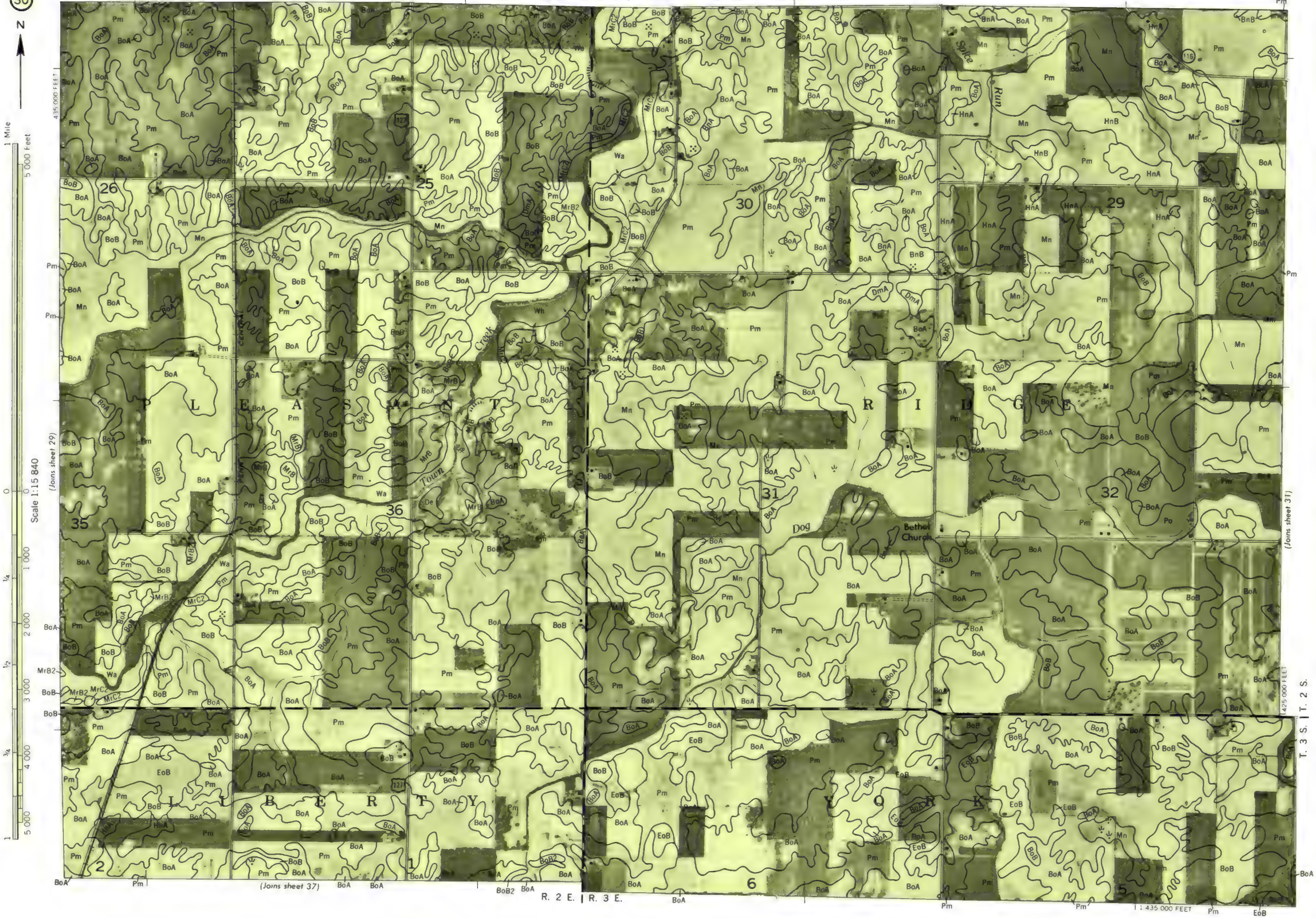


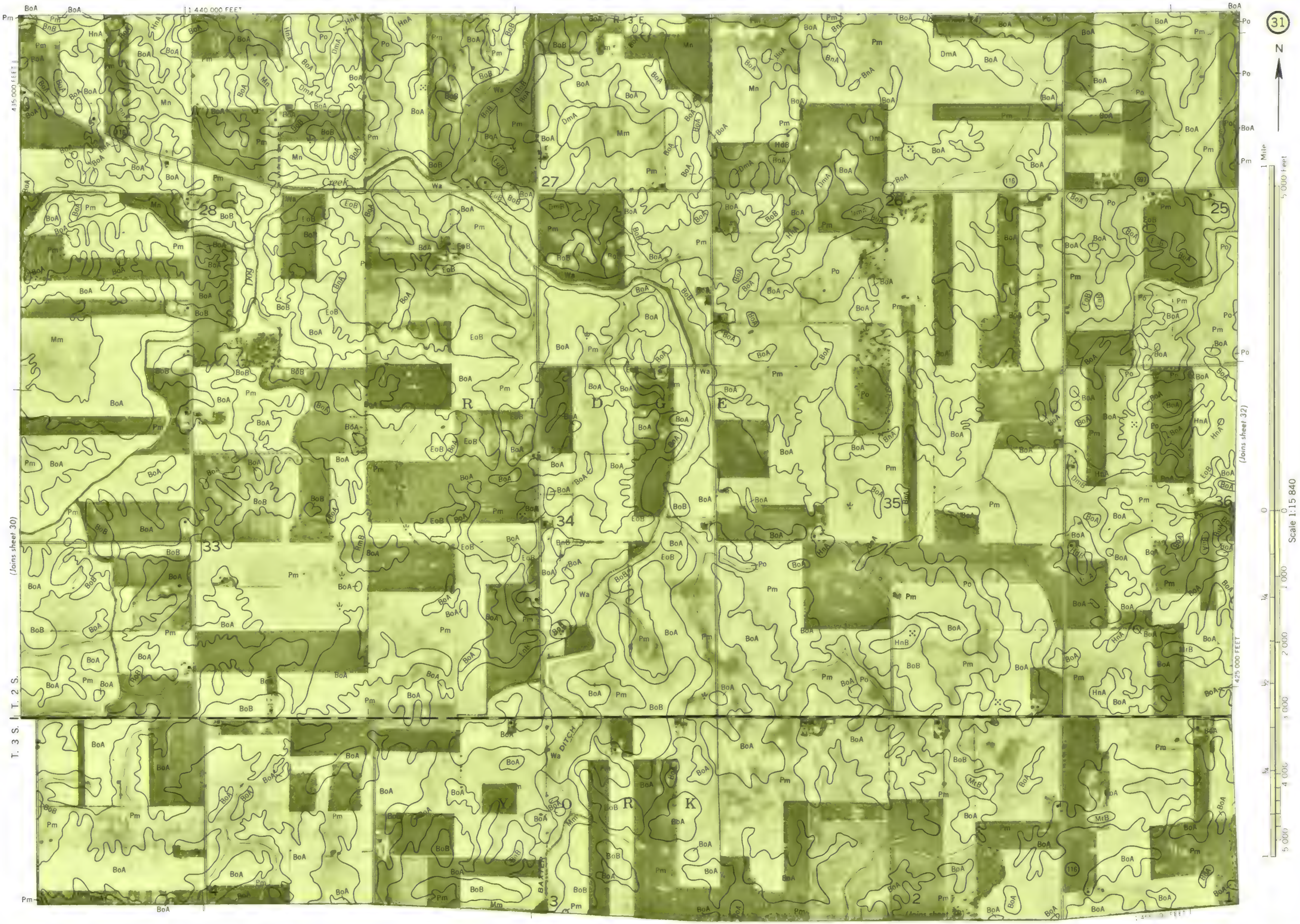

27
N
(Joins sheet 20)
(Joins sheet 28)
(Joins sheet 34)
1 365 000 FEET
435 000 FEET
425 000 FEET
1 380 000 FEET
Middlebury
Pleasant View Church
H A R R I S O N
W I L L S H I R E
INDIANA
ADAMS COUNTY
Twentyseven Mile Creek
T. 2 S.
T. 3 S.
R. 1 E.
30
29
28
27
31
32
33
34
6
5
4
3
Scale 1:15 840
1 Mile
5 000 Feet


N
(Joins sheet 21)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 35)
1 385 000 FEET
1 400 000 FEET
435 000 FEET
425 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
H A R R I S O N
P L E A S A N T
W I L L S H I R E
L I B E R T Y
St Thomas School
Madder Creek
T. 2 S.
T. 3 S.
R. 1 E.
R. 2 E.
27
26
25
30
34
35
36
31
3
2
1
6

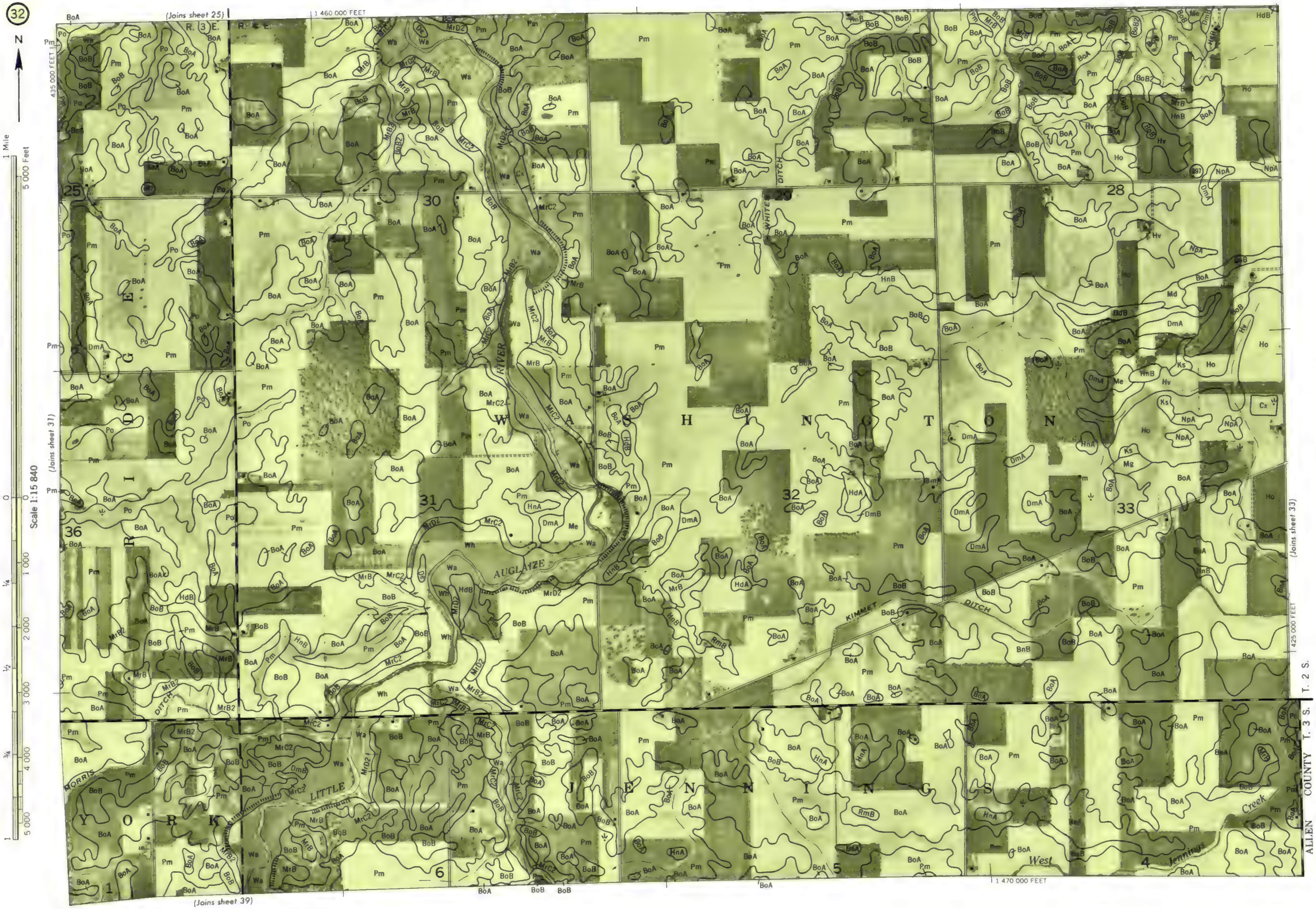
VAN WERT COUNTY, OHIO — SHEET NUMBER 29




N
(Joins sheet 23)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 37)
1 420 000 FEET
435 000 FEET
425 000 FEET
1 435 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
P L E A S A N T
R I D G E
L I B E R T Y
Y O R K
R. 2 E. | R. 3 E.
T. 2 S. | T. 3 S.
Town Creek
Dog Creek
Spice Run
Bethel Church
26
25
30
29
35
36
31
32
2
1
6
5

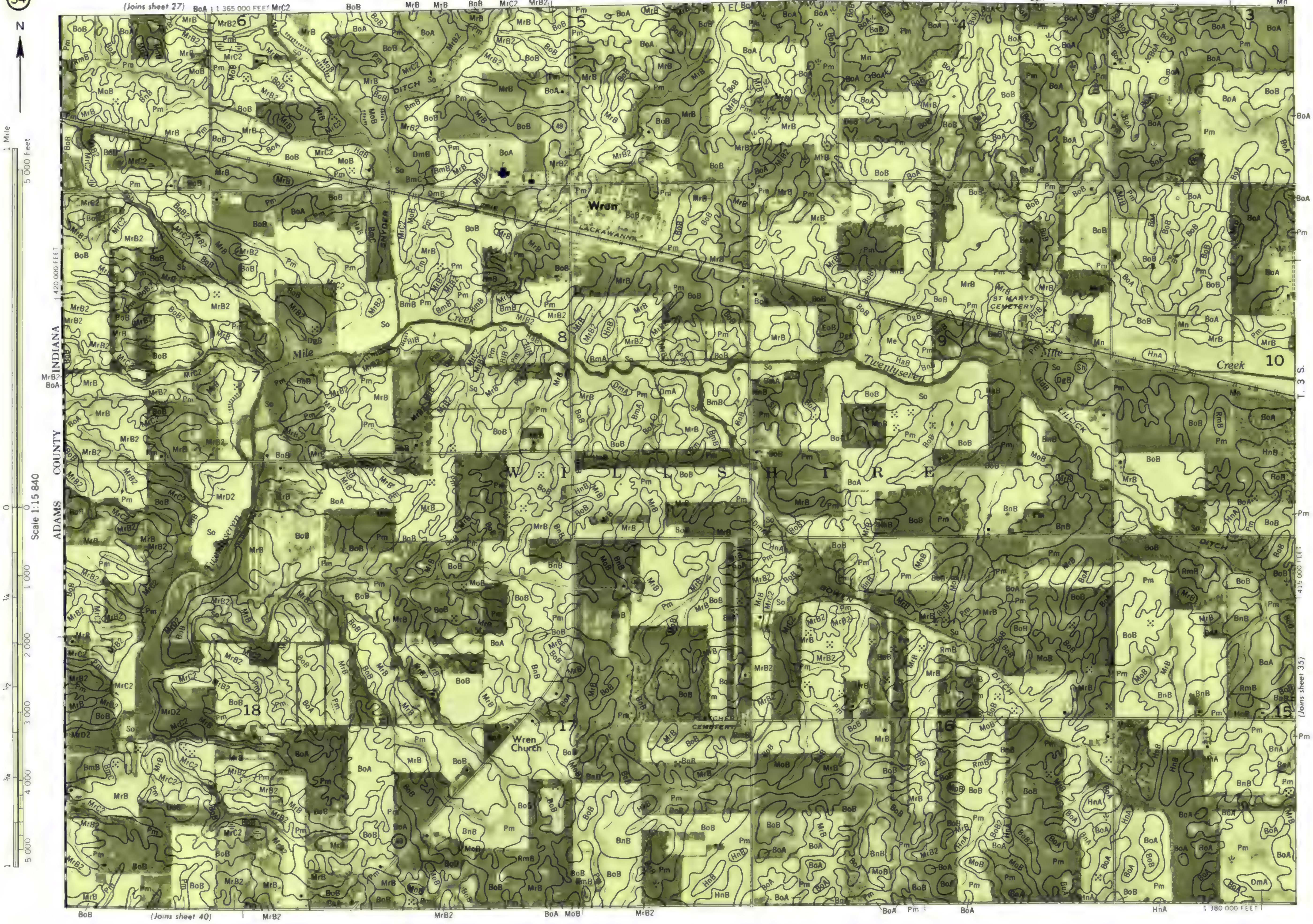


31
N
1 440 000 FEET
435 000 FEET
425 000 FEET
R. 3 E.
T. 2 S.
T. 3 S.
R I D G E
Y O R K
Dog Creek
BAKER DITCH
(Joins sheet 30)
(Joins sheet 32)
Scale 1:15 840
1 Mile
5 000 Feet


32
N
(Joins sheet 25)
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 39)
1 460 000 FEET
1 470 000 FEET
435 000 FEET
425 000 FEET
R. 3 E.
R. 4 E.
T. 2 S.
T. 3 S.
ALLEN COUNTY
1 Mile
5 000 Feet
Scale 1:15 840
RIDGE
WASHINGTON
JENNINGS
YORK
AUGLAIZE RIVER
WHITE DITCH
KIMMET DITCH
LITTLE AUGLAIZE
MORRIS DITCH
West Jennings Creek
25
28
29
30
31
32
33
36
1
4
5
6

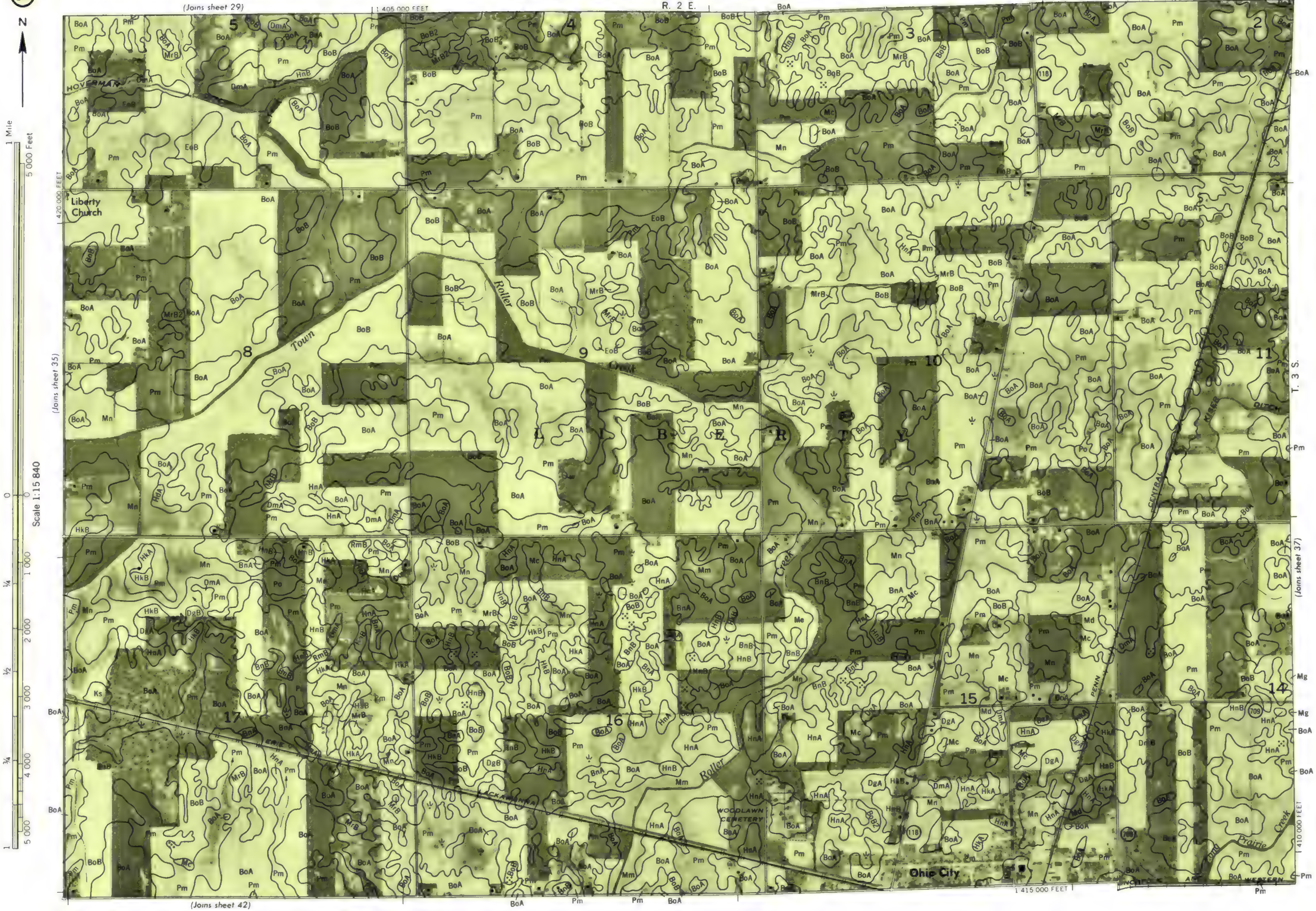

R. 4 E.
(Joins sheet 26)
(Joins sheet 32)
T. 2 S.
1 475 000 FEET
430 000 FEET
425 000 FEET
1 490 000 FEET
W A S H I N G T O N
DELPHOS
Jefferson High School
ALLEN COUNTY
ALLEN COUNTY
N
Scale 1:15 840
1 Mile
5 000 Feet
27
26
25
34
35
36

VAN WERT COUNTY, OHIO — SHEET NUMBER 34

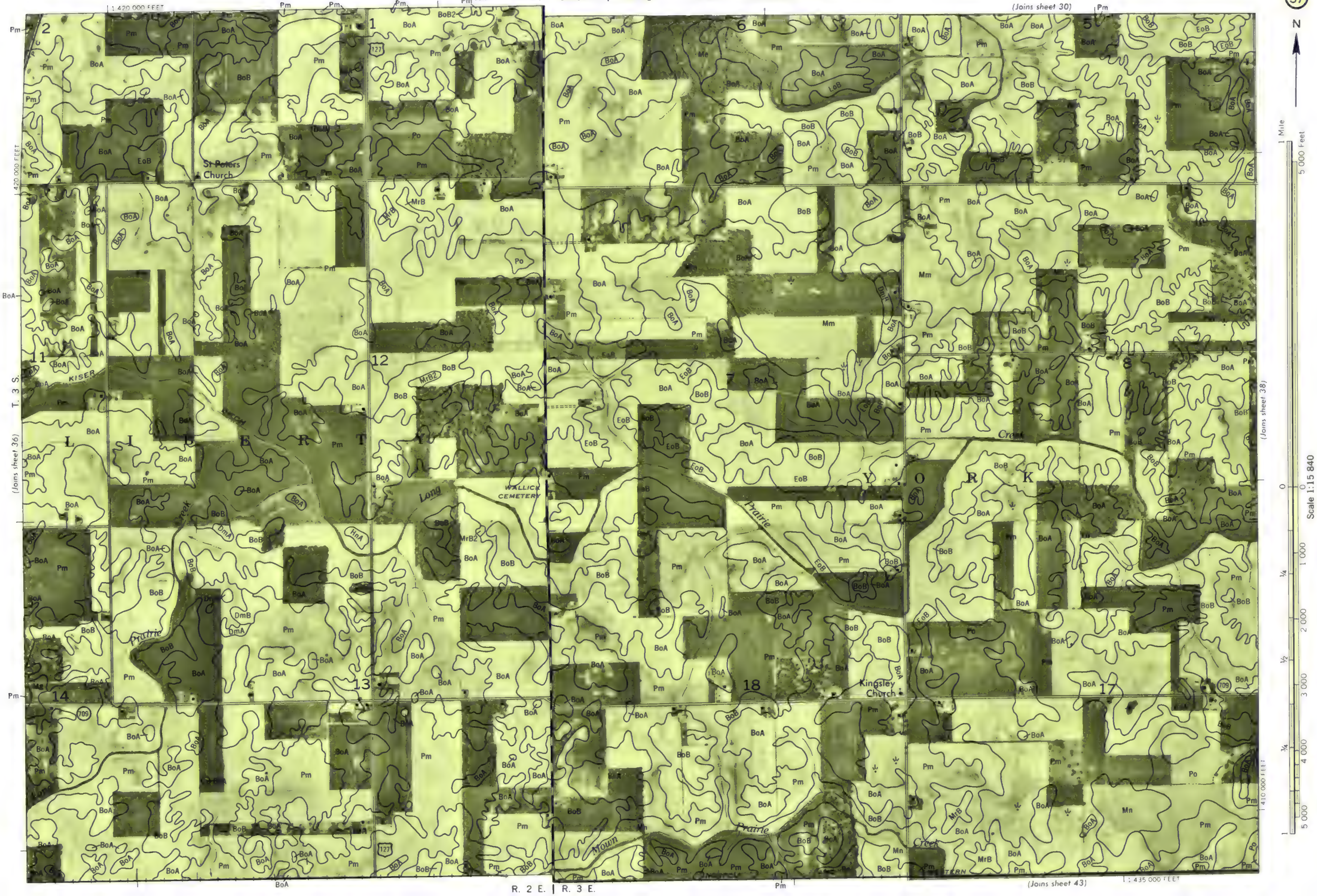



35
R. 1 E.
R. 2 E.
(Joins sheet 28)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 41)
T. 3 S.
W I L L S H I R E
Glenmore
Greenbrier Church
Twentyseven Mile Creek
LACKAWANNA
ERIE
HOVERMAN DITCH
1 385 000 FEET
1 395 000 FEET
420 000 FEET
410 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
N

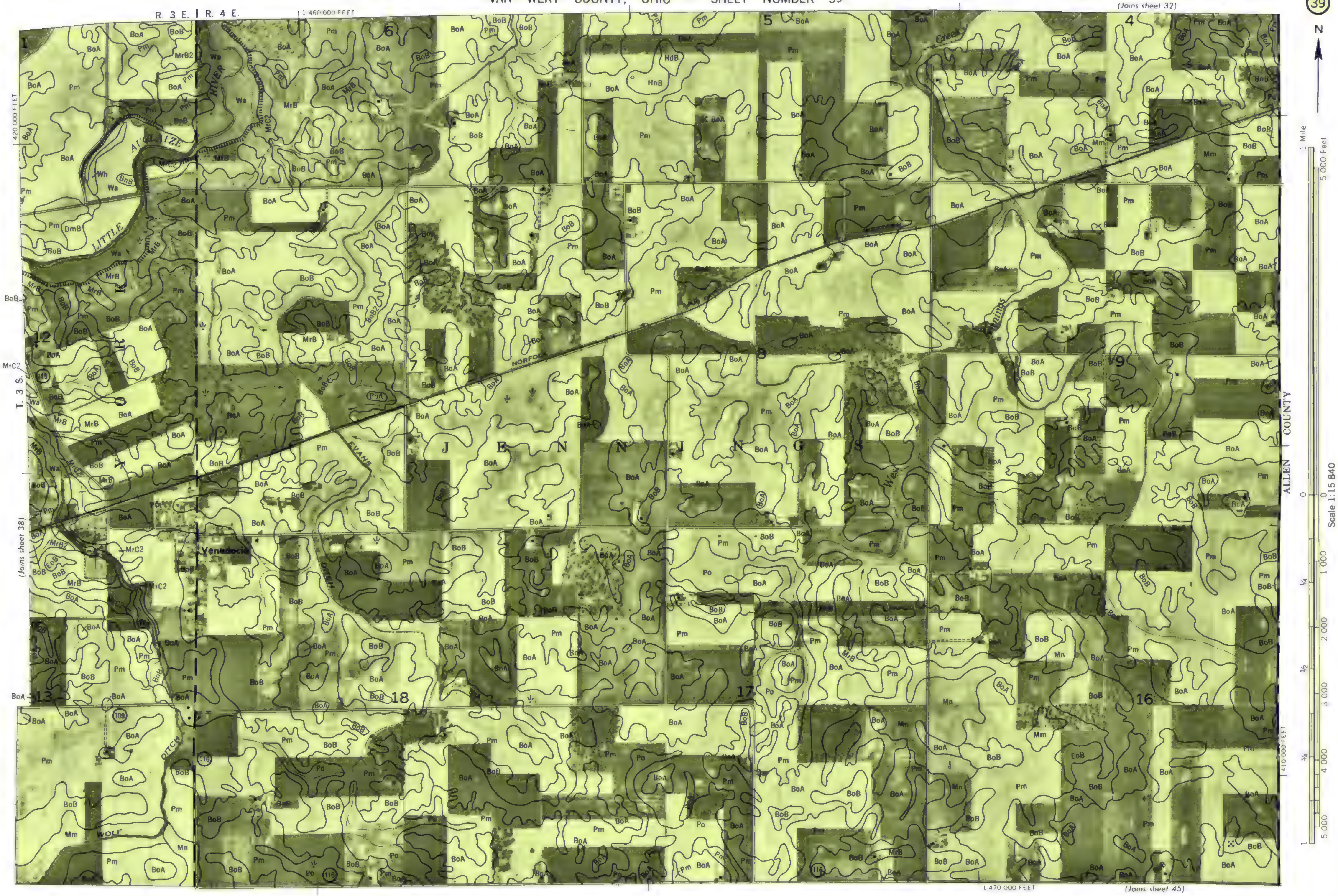
VAN WERT COUNTY, OHIO — SHEET NUMBER 36



VAN WERT COUNTY, OHIO — SHEET NUMBER 37



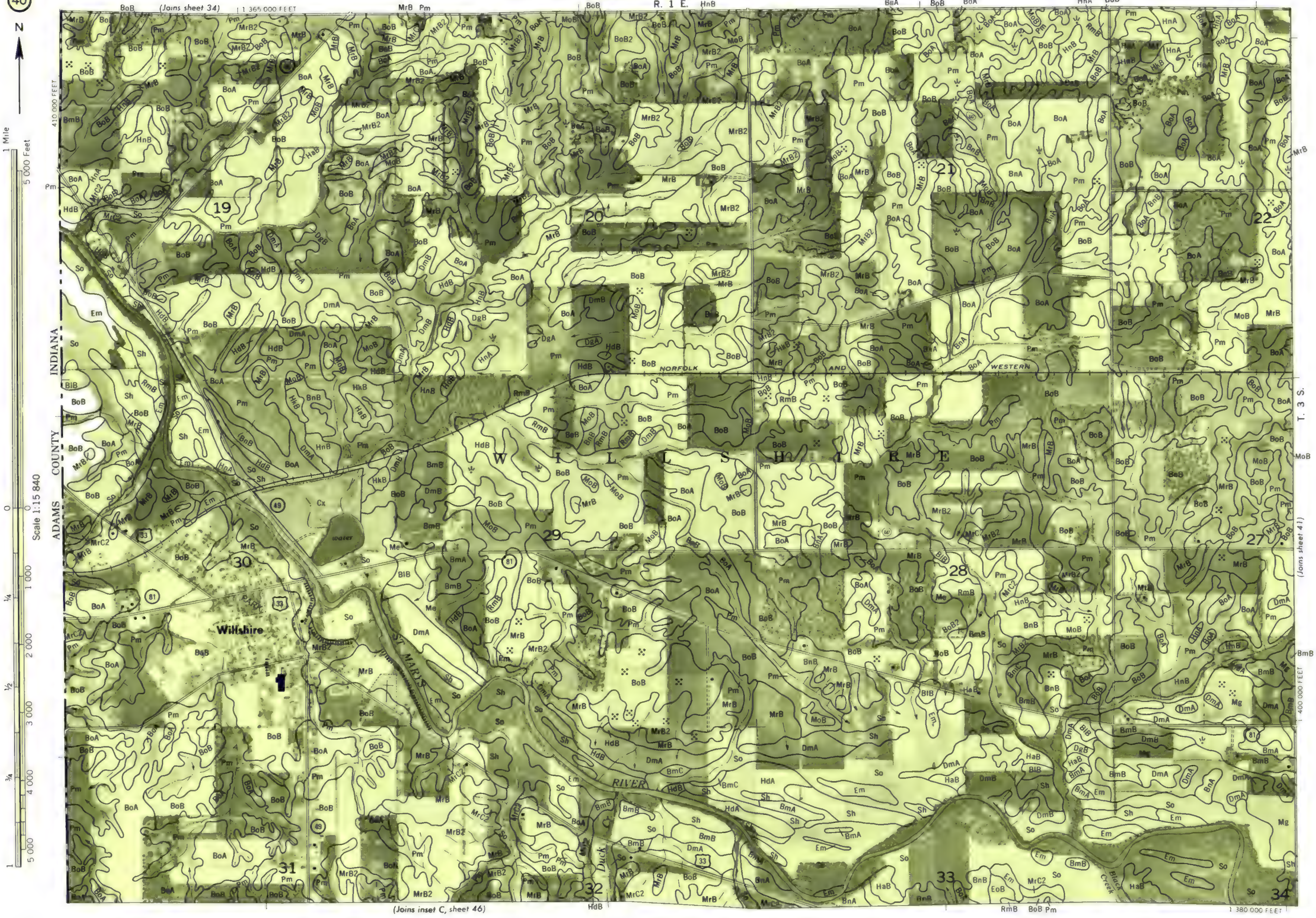
VAN WERT COUNTY, OHIO — SHEET NUMBER 38



39
(Joins sheet 32)
(Joins sheet 38)
(Joins sheet 45)
R. 3 E. | R. 4 E.
1 460 000 FEET
1 470 000 FEET
420 000 FEET
410 000 FEET
T. 3 S.
N
ALLEN | COUNTY
JENNINGS
Venedocia
AUGLAIZE RIVER
LITTLE AUGLAIZE
NORFOLK
EVANS DITCH
WOLF DITCH
Jennings Creek
West
Scale 1:15 840
1 Mile
5 000 Feet

VAN WERT COUNTY, OHIO — SHEET NUMBER 40

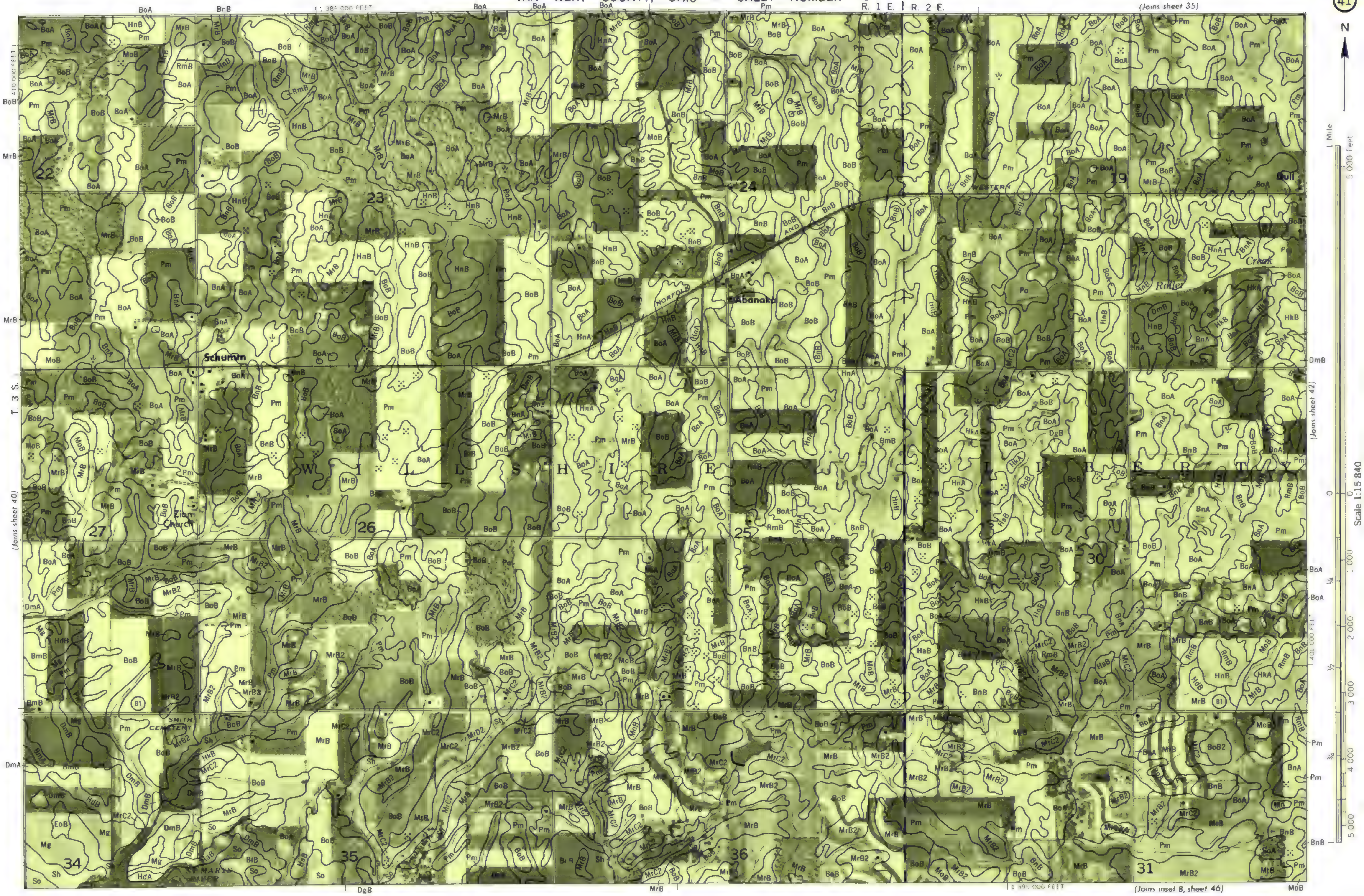
(Joins sheet 34)



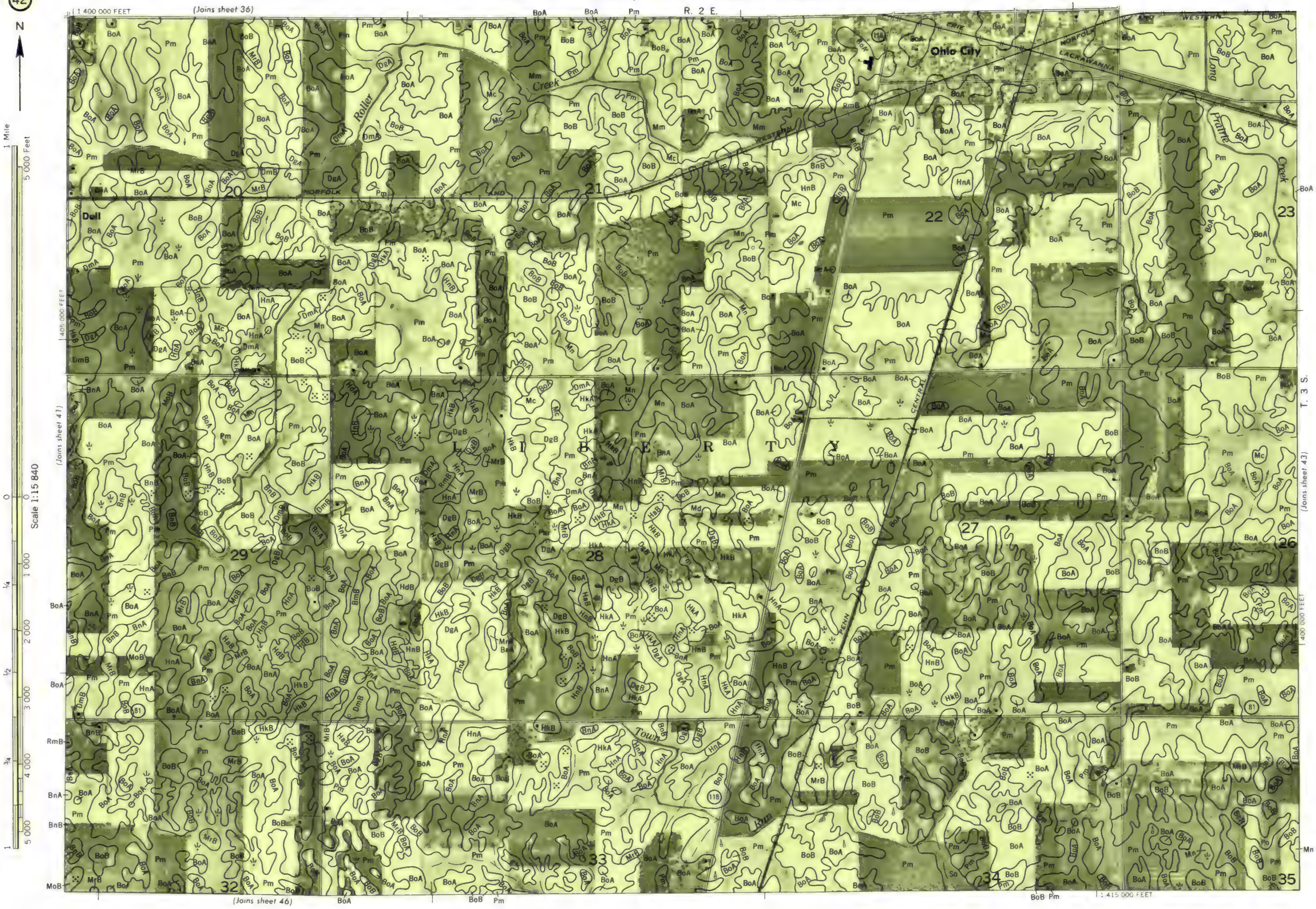
(Joins sheet 41)

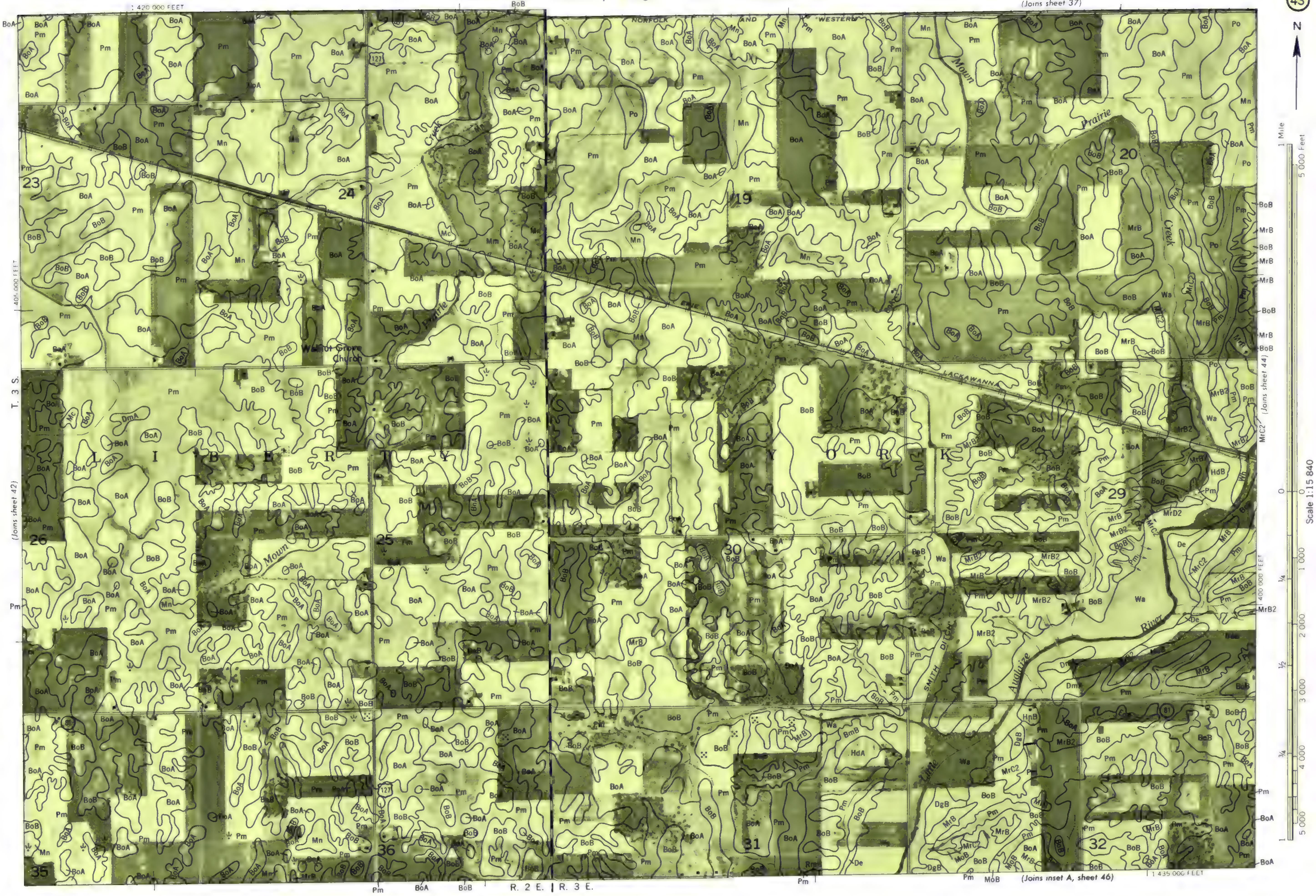
(Joins inset C, sheet 46)

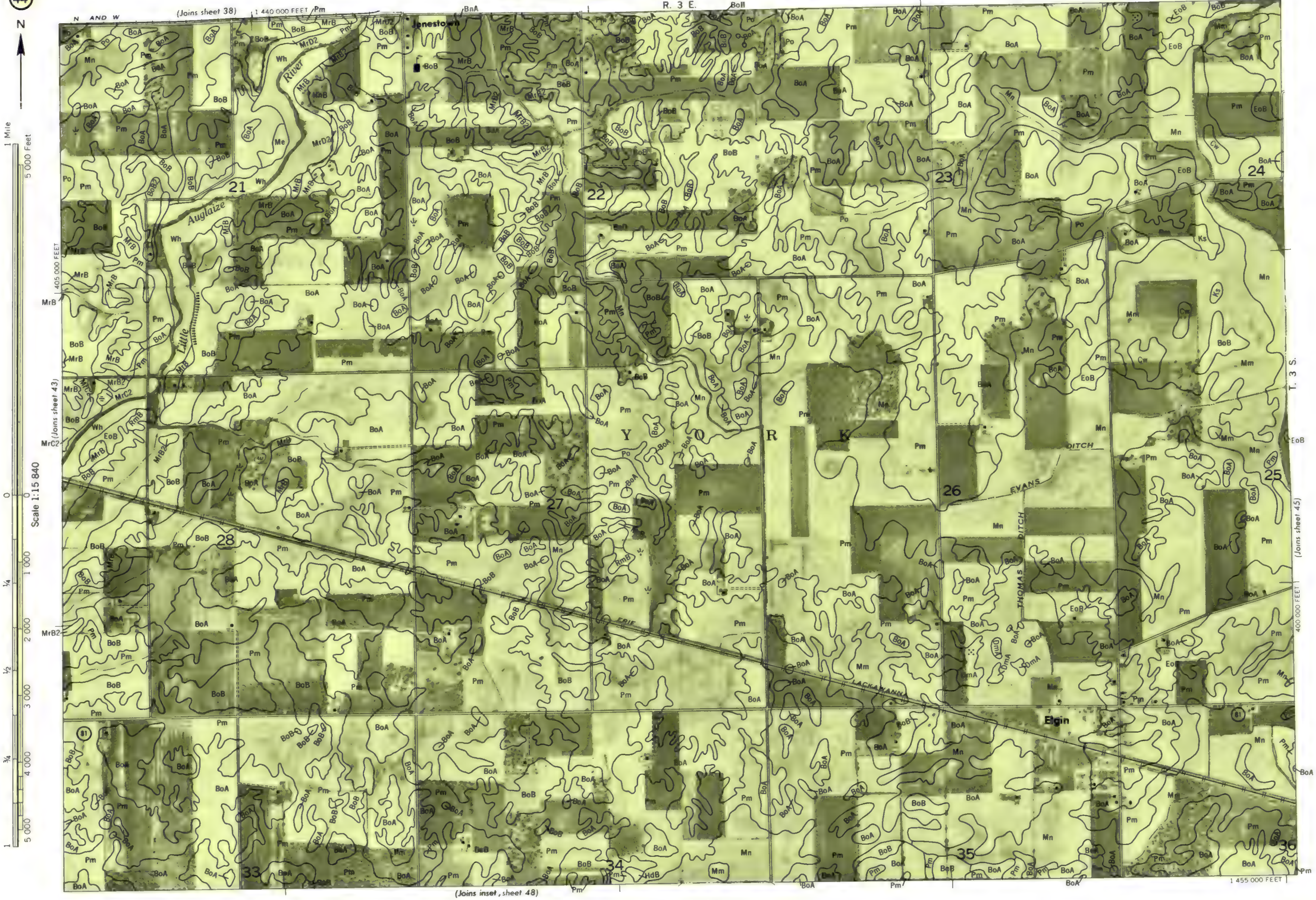
VAN WERT COUNTY, OHIO — SHEET NUMBER 41

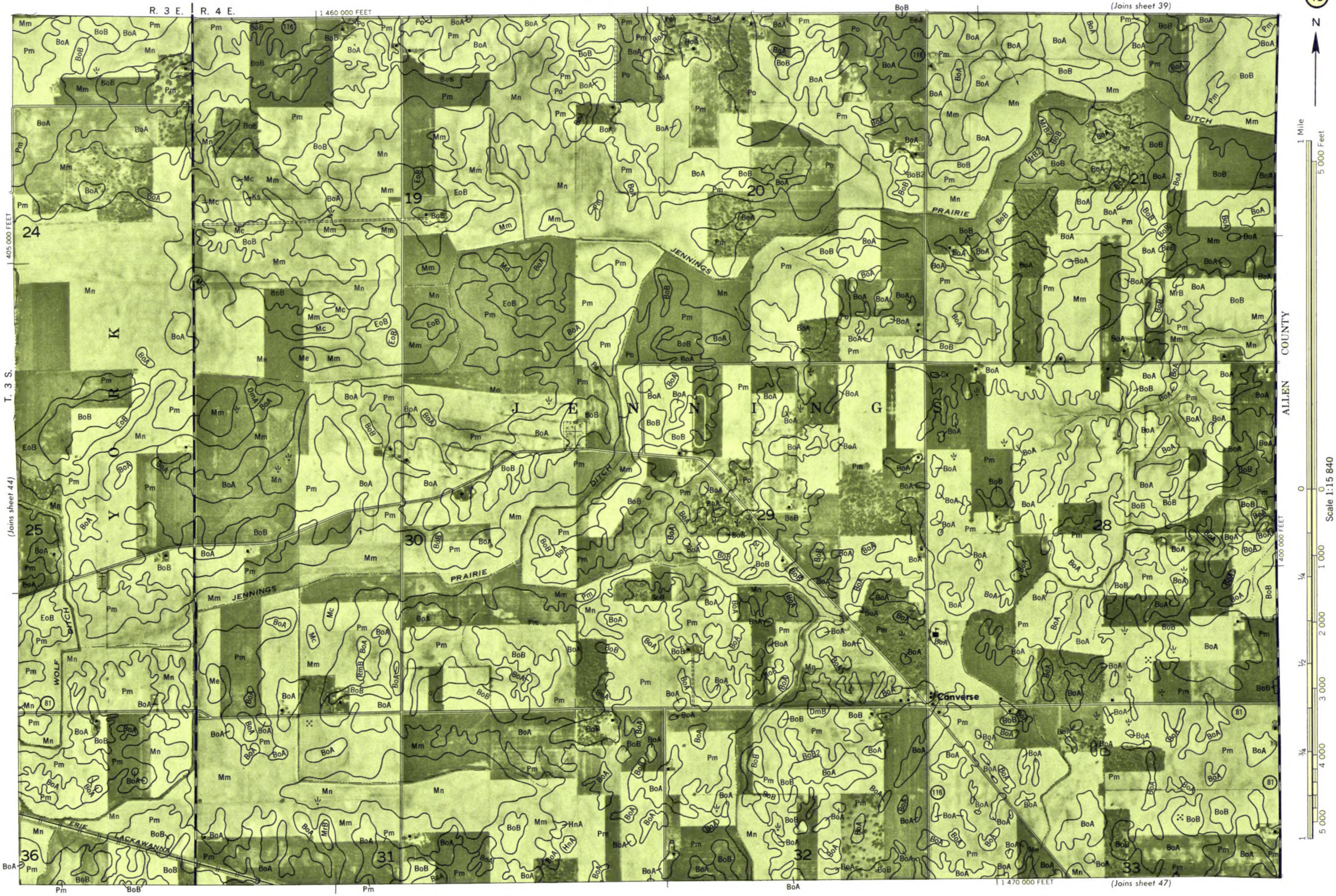


VAN WERT COUNTY, OHIO — SHEET NUMBER 42

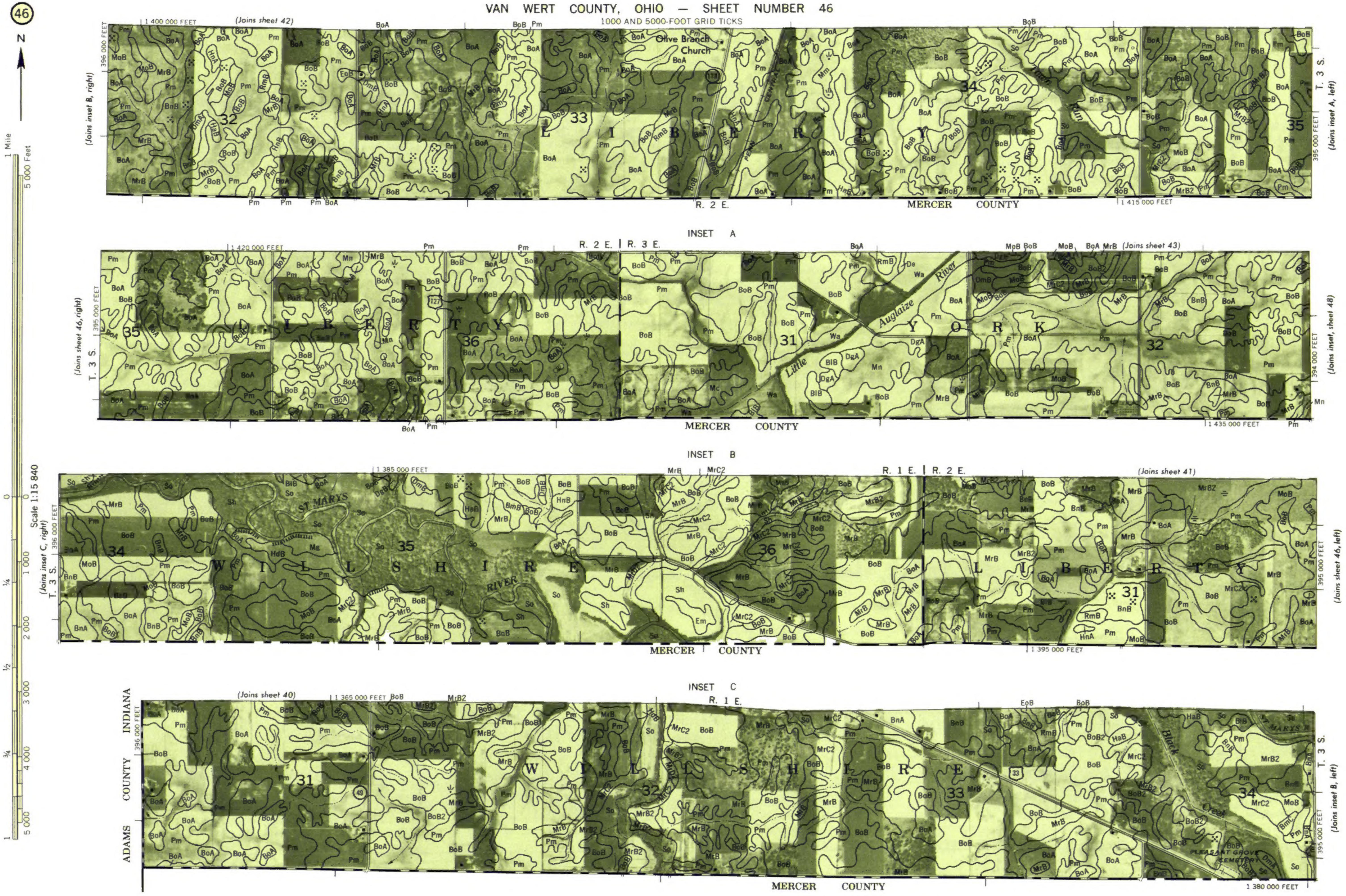



(Joins sheet 37)
(Joins sheet 42)
(Joins sheet 44)
(Joins inset A, sheet 46)
1 420 000 FEET
1 435 000 FEET
400 000 FEET
N
Scale 1:15 840
1 Mile
5 000 Feet
T. 3 S.
R. 2 E.
R. 3 E.
L I B E R T Y
Y O R K
NORFOLK AND WESTERN
ERIE LACKAWANNA
Walnut Grove Church
Prairie Creek
Mown Creek
Auglaize River
SMITH Ditch
Little
127
81
19
20
23
24
25
26
29
30
31
32
35
36


N AND W
(Joins sheet 38)
1 440 000 FEET
R. 3 E.
Jonestown
River
Auglaize
Little
21
22
23
24
25
26
27
28
33
34
35
36
Y
O
R
K
EVANS
DITCH
THOMAS
ERIE
LACKAWANNA
Elgin
81
T. 3 S.
(Joins sheet 43)
(Joins sheet 45)
(Joins inset, sheet 48)
405 000 FEET
400 000 FEET
1 455 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840

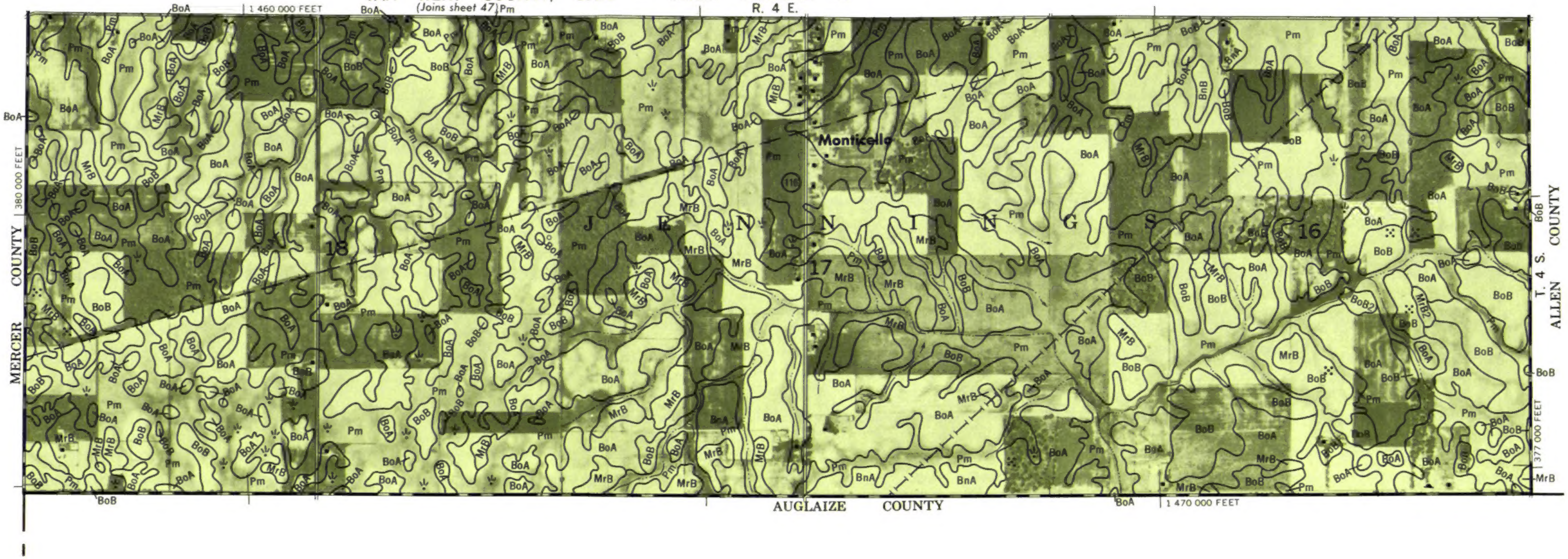

R. 3 E.
R. 4 E.
T. 3 S.
1 460 000 FEET
1 470 000 FEET
405 000 FEET
400 000 FEET
(Joins sheet 39)
(Joins sheet 44)
(Joins sheet 47)
N
ALLEN COUNTY
J E N N I N G S
Y O R K
JENNINGS PRAIRIE DITCH
WOLF DITCH
ERIE LACKAWANNA
Converse
19
20
21
24
25
28
29
30
31
32
33
36
1 Mile
5 000 Feet
Scale 1:15 840

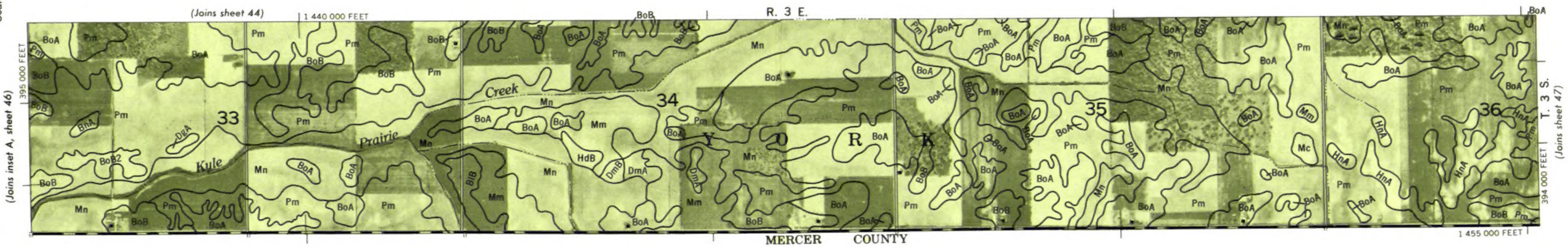
VAN WERT COUNTY, OHIO — SHEET NUMBER 46



VAN WERT COUNTY, OHIO — SHEET NUMBER 47

VAN WERT COUNTY, OHIO — SHEET NUMBER 48





N

Scale 1:15 840

1 Mile | 5 000 Feet | 0 | 1/4 | 1/2 | 3/4 | 1 000 | 2 000 | 3 000 | 4 000